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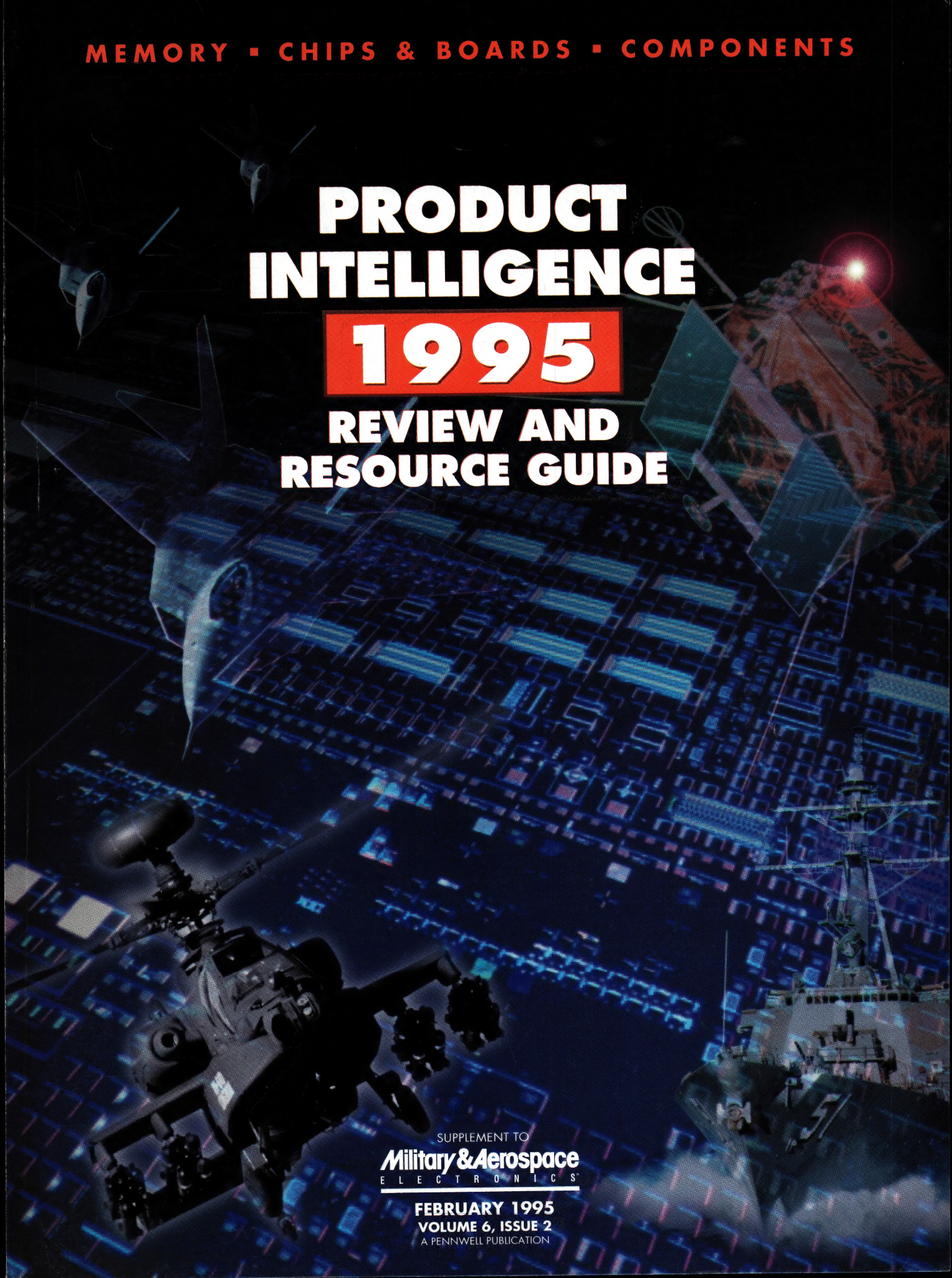
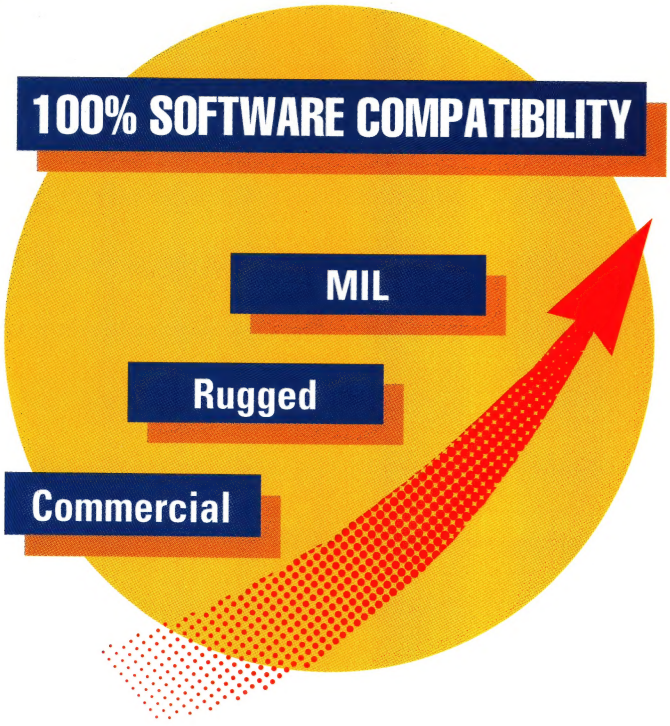
PRODUCT INTELLIGENCE 1995

REVIEW AND RESOURCE GUIDE



SUPPLEMENT TO
Military & Aerospace ELECTRONICS
FEBRUARY 1995
VOLUME 6, ISSUE 2
A PENNWELL PUBLICATION



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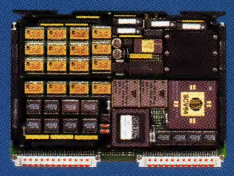
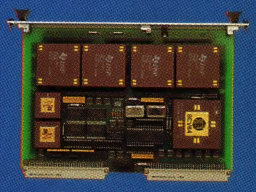
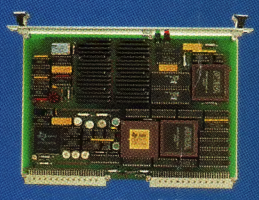


SBCs



DSPs



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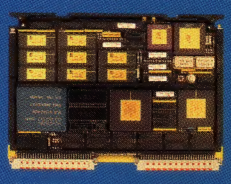
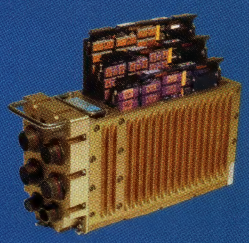


1553
Communications
LANs



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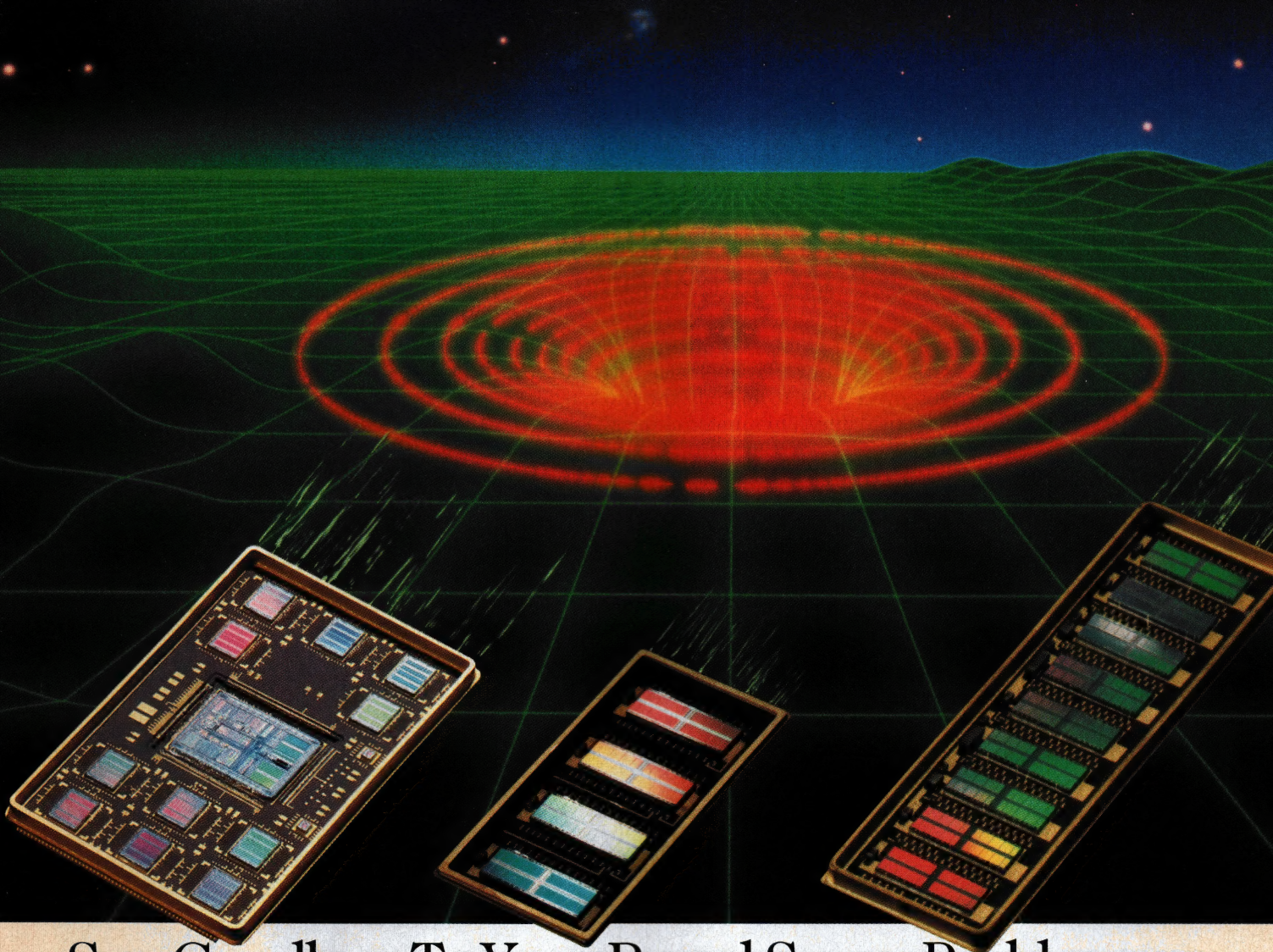

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CIRCLE 2 ON READER SERVICE CARD

COMMENT

Kelly Sewell
Associate Editor

M&AE welcomes you to the second annual *Product Intelligence Review and Resource Guide*, a compilation of all the Product Intelligence features from the pages of *Military & Aerospace Electronics* during 1994. We have also included some popular topics from our 1994 Guide to bring you a total of 17 topics of interest.

All product listings are up-to-date as of December 1994 to include the most recent products available. This undertaking would not have been possible without the cooperation of more than 330 companies who re-submitted information for the tables to reflect all their new products introduced over the past year. We've also expanded our listings to accomodate new entrants to the marketplace. Please keep in mind that the listings may not represent the company's full product line but a sampling of their products. Contact the company for complete information. In addition, accompanying articles have been edited to include the most pertinent product and market trend information.

We hope the guide will be a valuable source of the most current mil-spec and rugged products available to designers today, and we welcome your suggestions. Mail comment to my attention at *Military & Aerospace Electronics*, 10 Tara Blvd., 5th floor, Nashua, N.H., 03062-2801, or E-mail them to 711-7242@mcimail.com. I look forward to hearing from you as we continue to offer the most current and informative Resource Guide on the market today.

INDEX TO ADVERTISERS

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Vista Controls Corp.	S69	18

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PRODUCT INTELLIGENCE 1995 REVIEW AND RESOURCE GUIDE

SUPPLEMENT TO

Military & Aerospace ELECTRONICS

February 1995
Volume 6 Issue 2
A PennWell Publication

INSIDE

S4 A-D converters
S7 Magnetic hard disk drives
S11 Optical hard disk drives
S13 ac/dc power supplies
S18 DSP chips
S22 Connectors
S26 CPLDs, FPGAs
S30 IR sensors
S33 dc/dc converters
S43 Solid-state storage
S47 DSP boards
S57 VME CPU boards
S70 SRAMs/DRAMs
S75 Mil-spec resistors & capacitors
S78 Ada compilers
S81 Input devices
S86 EPROMs/EEPROMs

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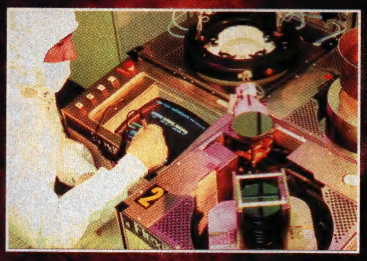

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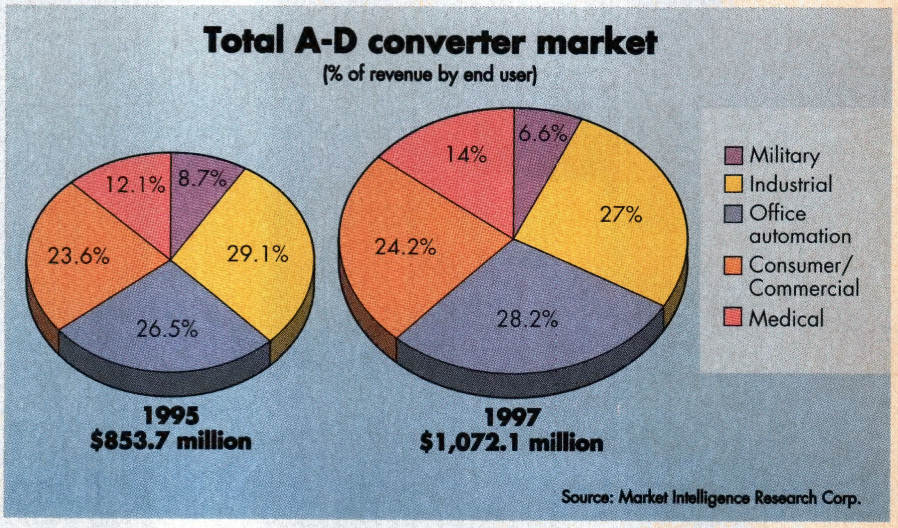
Photo courtesy NASA

CIRCLE 3 ON READER SERVICE CARD

14-bit A-D converters have what it takes

Higher A-D speed and resolution satisfy military user demands for ever more information from sensors.



Picture this: it's wartime, intelligence reports have indicated an enemy buildup for some time, and all fighter/bomber squadrons are on highest alert. Knowing that friend and foe on the ground are in close proximity, the backseat weapons system officer in the lead F-15E suddenly sees an ominous shape on his imaging radar screen. Readying to fire a Maverick air-to-ground missile, the officer realizes he can't make out enough detail from the image on his screen to tell conclusively if the shape is ally or enemy. Seconds count. Should he shoot and take a chance of hitting one of his own tanks?

The weapons officer shouldn't have to guess at what's out there, and with analog-to-digital (A-D) converters of sufficient speed and resolution in the radar system, he probably wouldn't have to. It is this kind of real life-and-death scenario that drives many of today's A-D designs. As military users demand advanced electronic equipment that enables them to exploit sensor data faster and at longer ranges, systems integrators are clamoring for ever higher A-D speeds and resolution.

Yet there is no perfect answer when choosing the right A-D converter. Some of the most sophisticated A-D converters available come in 14-bit resolution, which offer acceptable speed and resolution for many military applications. These new devices, which entered the high-end mainstream in 1994, offer digital signals roughly twice as detailed as those available with the generation of 12-bit converters they replaced. Although A-Ds come in even finer resolution—16-, 18-, and even 20-bit devices—today's 14-bit converters offer one of the best compromises between speed and resolution for demanding and fast-moving applications such as tactical radar systems.

The A-D converter is a crucial component in today's sensor-intensive digital military systems. A radar, sonar, or infrared signal at the sensor is analog and measured in voltage. But before the analog signal can be processed and displayed on screens or used to cue weapons, it must be transformed into a digital stream of ones and zeros. That's the A-D converter's job.

Signal resolution

As military users demand ever more information from sensors, and as the sensors themselves become more sophisticated, the A-D converter's resolution, as measured in bits, increases in importance. The converter breaks up a sensor's signal into pieces for digitizing. The higher the resolution, the more pieces of the signal, and the clearer the signal. Yet signal clarity comes at a price — speed.

Among 14-bit A-D converters, the state of the art in speed is about 10 MHz. The first 20 MHz A-D converter was announced in December 1994.

If the choice of an A-D converter were as simple as trading speed for resolution, however, most electronic designers would have an easy time. But in military applications, especially where size, weight, and power consumption are of growing importance, designers have many more factors to consider. Speed comes at the price not only of resolution, but also of power consumption. Generally, the higher the speed, the more power the device consumes.

Hybrids or monolithics?

Aside from the speed vs. resolution tradeoff, perhaps the most important consideration for designers when choosing the right A-D is whether to use a hybrid or monolithic device. Monolithics offer the advantages of small size, light weight, and low power consumption. But they gain these benefits at the price of performance.

Some companies, however, are making a clean break from hybrids in favor of monolithics, banking on the notion that smaller size, lower power consumption, and more affordable prices will compensate in the short term for compromised performance, and claiming that the performance of monolithics inevitably will follow within the next several years.

The drastically reduced costs of monolithic A-D converters also may offer the designer some options that simply have not been available before. M&AE

14-BIT A-D CONVERTERS

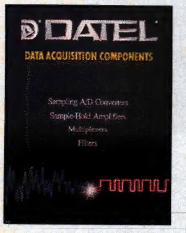
Model	Sample Rate (Samples/s)	Resolution (bits)	Input bandwidth	Linearity error (±LSB)	Power dissipation (Watts)	Sample and hold	Internal reference	Packaging	Mil-specs	Price (100s)	Comments
Analog Devices, One Technology Way, P.O. Box 9106, Norwood, MA 02062-9106 (617) 329-4700, fax (617) 329-8703 Circle 100											
AD7710	10 Hz to 1 kHz	21	60 Hz	0.0015%	45 mW	–	Yes	24-pin Cerdip	Mil-Std-883B	Consult factory	Monolithic sigma-delta signal conditioning converter
AD1385	500 kHz	16	–	0.0015%	2.76 W	No	Yes	48-pin Cerdip	Same as above	Consult factory	Hybrid, multi-pass subranging, internal linearity calibration
AD1378	16µs	16	–	0.006%	800 mW	No	Yes	32-pin Cerdip	Same as above	$188	Hybrid, SAR
AD679	100k	14	1 MHz	2	560 mW	Yes	Yes	28-pin Cerdip, 44-pin JLCC	Same as above	$124 (1,000s)	Monolithic, recursive subranging
AD676	100k	16	1 MHz	2	235 mW	Yes	No	28-pin Cerdip	Same as above	$146 (1,000s)	Compound monolithic, switched capacitor/charge redistribution
Analogic Corp., 360 Audubon Road, Wakefield, MA 01880 (508) 977-3000, fax (617) 245-1274 Circle 101											
ADC4322	2 MHz	16	6 MHz	1	2.2	Yes	Yes	46-pin Dip	No	$995 to $1,196	Two versions: ADC4322A 0° to +70° C; ADC4322B -25° to +85° C
ADC4320	1 MHz	16	3 MHz	1	2.2	Yes	Yes	46-pin Dip	No	$885 to $1,062	ADC4320A 0° to +70° C; ADC4320B -25° to +85° C
ADC4325	500 kHz	16	2.6 MHz	1	2.2	Yes	Yes	46-pin Dip	No	$585 to $702	ADC4325A 0° to +70° C; ADC4325B -25° to +85° C
ADC3111	2 MHz	14	2 MHz	1	4	Yes	Yes	Module	No	$678	–
ADC5020	144 kHz	18	1 MHz	1	2.1	Yes	Yes	Module	No	$341	5030 available on S/H-lower cost
ADC3120	20 MHz	14	80 MHz	1	5	Yes	Yes	46-pin Dip	No	$3,500	–
AH30217P	300/S	17	–	1	0.6	No	Yes	40-pin Dip	No	$255	Triple slope integrating converter
Burr-Brown, P.O.Box 11400, Tucson, AZ 85706 (602) 746-7616, fax (602) 746-7401 Circle 102											
ADC614	5 MHz	14	60 MHz	0.9	6.1	Yes	Yes	46-pin 4x	No	$495	No Mil-Std-883 devices, but have special "Q" screen
Crystal Semiconductor Corp., P.O. Box 17847, Austin, TX 78760-7847 (512) 442-7555, fax (512) 445-2831 Circle 103											
CS5014	56 kHz	14	–	1/2	1.120	Yes	No	40-pin Dip, 44-pin LCC	Mil-Std-883	$150.90	Available to SMD DWG 5962-89674
CS5016	50 kHz	16	–	1	0.120	Yes	No	Same as above	Same as above	$271.50	Available to SMD DWG 5962-89676
CS5101A	100 kHz	16	–	1	0.28	Yes	No	28-pin Dip/LCC	Same as above	$323.30	Available to SMD DWG 5962-91691
CS5102A	20 kHz	16	–	1	0.044	Yes	No	28-pin Dip/LCC	Same as above	$153.20	Available to SMD DWG 5962-91692
CS5336	50 kHz	16	22 kHz	–		Yes	Yes	28-pin Cerdip	Same as above	$241.50 @100pcs	Available to SMD DWG 5962-94690
Datel Inc., 11 Cabot Blvd., Mansfield, MA 02048 (508) 339-3000, fax (508) 339-6356 Circle 104											
ADS-930	500 kHz	16	2 MHz	1	3.4	Yes	Yes	40-pin TDip	Yes	$337	Operates over full mil-temp range, on-board FIFO
ADS-931	1 MHz	16	2 MHz	1	3.9	Yes	Yes	40-pin TDip	Yes	$639	Same as above
ADS-926	500 kHz	14	7 MHz	1/2	1.3	Yes	Yes	24-pin Ddip	Yes	$212	Good frequency domain performance
ADS-927	1 MHz	14	7 MHz	1/2	1.4	Yes	Yes	24-pin Ddip	Yes	$245	Small size, full mil-temp range
ADS-942(A)	2 MHz	14	6 MHz	1/2	2.2	Yes	Yes	32-pin Tdip	Limited	$280	Version for reduced power

14-BIT A-D CONVERTERS

Model	Sample Rate (Samples/s)	Resolution (bits)	Input bandwidth	Linearity error (±LSB)	Power dissipation (Watts)	Sample and hold	Internal reference	Packaging	Mil-specs	Price (100s)	Comments
Datel Inc., 11 Cabot Blvd., Mansfield, MA 02048 (508) 339-3000, fax (508) 339-6356 Circle 104 *(Continued)*											
ADS-944	5 MHz	14	20 MHz	1/2	2.9	Yes	Yes	32-pin Tdip	Yes	$495	Outstanding size and power
ADS945	10 MHz	14	100 MHz	1/2	4.9	Yes	Yes	2x4-in. module	Limited	$860	–
Micro Networks, 324 Clark Street, Worcester, MA 01606 (508) 852-5400, fax (508) 853-8296 Circle 105											
MN6400T/B	50 kHz	16	–	1	740 mW	Yes	Yes	28-pin Dip	Mil-H-38534, SMD	$250	Self-calibrating
MN6450T/B	47 kHz	16	–	1	740mW	Yes	Yes	32-pin Dip	Same as above	$250	Self-calibrating; bus driver
MN6500T/B	100 kHz	16	–	1	685 mW	Yes	Yes	24-pin Dip	Mil-H-38534	$285	Self-calibrating; serial out
MN6290T/B	20 kHz	16	10 kHz	2	1.5	Yes	Yes	32-pin Dip	Mil-H-38534	$270	Low distortion
MN5290H/B	25 kHz	16	–	2	1.1	No	Yes	32-pin Dip	Same as above	$276	Mil-temp range
MN5430	10 MHz	14; 84dB	5 MHz	–	3.5	Yes	Yes	46-pin Dip	Mil-H-38534	$800	Auto-ranging; 84dB dynamic range; Hardware controlled auto-ranging
Sipex Corp., 22 Linnell Circle, Billerica, MA 01821 (508) 667-8700, fax (508) 670-9001 Circle 106											
HS9516	10 kHz	16	–	1/2	1.2	No	Yes	32-pin	Mil-Std-883	$497 (500)	Non-sampling, hybrid
HS9576	50 kHz	16	–	1/2	1.1	No	Yes	32-pin	Same as above	$325 (357)	Same as above
HS9476	50 kHz	16	25 kHz	1/2	1.5	Yes	Yes	32-pin	Same as above	$335 (373)	Sampling pin-to-pin with HS9576, hybrid
SP9588	500 kHz	14	–	1	2.5W	No	Yes	32-pin Triple Dip	Mil-Std-883	$441 (100pc)	–

PRODUCT & LITERATURE SHOWCASE

High-Performance Data Acquisition Components



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- S/H Amplifiers (acquisition times to 10nsec)
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- Multiplexers (switching times to 50nsec)
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Pushing the gigabytes in military drives

Rugged and military drive manufacturers are working to keep up with commercial technology.

Commercial drive technology changes every six months—if a drive isn't getting denser, it's getting smaller. With the long lead times inherent in most military programs, how does the military keep up with such rapid change?

The short answer is, it doesn't keep up. Often it requires six months just to build a drive to meet military specifications. Increasingly, the military is out of the loop in the development of new drive technology because the defense market accounts for such a small percentage of the total market.

Military customers are forced to accept what is being developed and must follow the trends being set by their commercial brethren. That is because they no longer have the budgets to design and build custom drives for each military application. This is not necessarily a disadvantage. Commercial drives come in many different flavors besides the popular Winchester magnetic drive, so military customers have a lot of options from which to choose, including so-called solid-state drives, tape drives, magnetic bubble drives, and optical drives.

Optical is still the emerging technology and is gaining favor in the military. However, magnetic drives remain the dominant technology. Manufacturers predict that as magnetic drives become faster, smaller, and more inherently rugged, their position as the military's drive of choice will become even more secure.

The military disk drive market has evolved into a two-tiered business: there are those manufacturers or "ruggedizers" who provide full mil-spec drives, customized drives and highly ruggedized drives for environmental and shock/vibration extremes, and those who provide a rugged product that is not field-deployable. Other companies have made an appearance recently to claim a share of the rugged magnetic disk drive pie.

Changes in technology

Magnetic disk drive technology has seen some changes over the last few years. Head technology has changed from monolithic ferrite heads in the earliest disk drives to metal-in-gap, then to thin-film, and then to the IBM-designed magneto-resistive (MR) heads.

Introduced in 1991, after 20 years of research, MR technology is capable of the highest areal densities, according to Frost & Sullivan Market Intelligence (Mountain View, Calif.). Not only is the material of the head important, but how far it flies from the media determines the achievable areal density (Mbytes/platter in a given density). Manufacturers are constantly trying to reduce flying heights. According to Frost & Sullivan, reductions in flying heights require more sophistication in the preparation of substrates, coatings, heads, and test equipment.

Other changes in the drive technology include higher track densities. State-of-the-art disks have a 2,000 tracks-per-inch (tpi) density. In the next few years, track density is predicted to increase to between 2,500 and 3,500 tpi. The latest media are using glass in their substrates. Media can be made of aluminum, aluminum alloys, carbon, ceramic, and glass.

On the move

What the military typically wants is ultra-reliable data during extremes of shock, vibration, and temperature. The Army dubbed this capability "on the move," which requires a drive to be able to send and receive information while a computer system is in a moving vehicle. The ruggedization process will have to account for shock, vibration, and operation in salt or humidity. Operation must also be possible even if the drive is dropped in the sand or mud and has to be cleaned off before it is re-inserted into a system.

On the move means something different for the Navy. Moving the disk drive into a plane aboard an aircraft carrier is just as important as actual operation in the plane.

On the move means something different again for disk drive manufacturers making product for space applications. Not only do they have to ruggedize the drive, but they must also account for single event upset (SEU) and compensate for no gravity by using a conduction-cooling system.

No threat to magnetic drives

Ruggedized drives will proliferate into more military systems this year and next, say both analysts and manufacturers. But it is doubtful that magnetic drives will ever be replaced by solid-state or optical drives.

Despite high hopes from developers, optical storage—compact disc read-only memory (CD-ROM) and rewritable magneto optical (MO)—is not threatening to displace the popular magnetic disk drive any time soon. They might be capable of higher areal densities (Mbytes/platter in a given density), but their access times are not nearly as fast as those of magnetic drives. However, because the media are removable and the track densities average about 16,000 tracks-per-inch, optical drives are gaining favor in the military.

Not only do the removable media offer security, but they are lighter weight than tape systems, which optical drives often replace, and work well for large data-storage and recording applications. M&AE

MIL-SPEC AND RUGGED MAGNETIC DISK DRIVES

Type	Model	Useable capacity (Mbytes)	Maximum access time (ms)	Average sustained data rate (Mbytes/s)	MTBF (hrs)	Vibration (Grms)	Shock (G)	Operating temperature (°C)	Price
Computing Devices International, 8800 Queen Avenue South, Bloomington , MN 55431-1996, (612) 921-6100, fax (612) 921-6869 Circle 112									
Sealed Removable Cartridge 3.5 in.	RMS-1105	1055	17.2 avg.	3.1	245,000	3.0	15 (11ms)	-40° to +60°	Contact CDI
Mil Disk System	MMU	1055	17.2 avg.	3.1	70,000	6.0	50 (6ms)	-40° to +70°	Contact CDI
Disk System 19 in. Rack Mount	TEMSS	2110	17.2 avg.	3.1	15,000	3.0	25 (6 ms)	-15° to +50°	Contact CDI
Disk System (Mil)	AN/UYH-11 VM(3)	4216	17.5 avg.	3.1	10,000	2.25	15	-40° to +65°	Contact CDI
Disk System (Mil)	AN/UYH-14	2108	17.5 avg.	3.1	20,000	2.0	30	-20° to +52°	Contact CDI
Disk System (Mil)	AN/UYH-16	4216	17.5 avg.	3.1	10,000	1.0	Mil-S-901C hardmount	0° to +50°	Contact CDI
Disk System (Commercial Aviation)	Avionics DDU	2108	17.5 avg.	3.1	15,000	4.1	6	-15° to +55°	Contact CDI
Disk System (Commercial Aviation)	Avionics MSU	1054	17.5 avg.	3.1	30,000	0.7	6	-15° to +55°	Contact CDI
Inter-Tech Corp., 4301 N. 75th Street, Suite 201, Scottsdale, AZ 85251 (602) 945-0085, fax, (602) 945-3080 Circle 113									
Removable Datamobile IDE slim profile	ITDM-540AT	540	8.5 (avg)/ 20 (max.)	8	300,000	1.5 (oper.)	10 (oper.)	0° to +50°	$1,095
Removable Datamobile SCSI slim profile	ITDM-10000I	1050	9 (avg)/ 26 (max.)	10	500,000	Same as above	Same as above	Same as above	$1,490
Removable Datamobile SCSI slim profile	ITDM-21000I	2140	8 (avg)/ 17 (max.)	10	800,000	Same as above	Same as above	Same as above	$1,985
Removable Datamobile SCSI high capacity	ITDM-42000H	4290	8 (avg)/ 17 (max.)	10	800,000	Same as above	Same as above	Same as above	$2,850
Iomega Corp., 1821 W. 4000 S., Roy, UT 84067 (800) 777-6179 Circle 114									
Bernoulli	Transportable Multidisk 150	150.9	9 (w Speed-cache Plus)	15.33 Mbits/s	110, 000	0.85 (oper.)/ 0.25 (oper.)	10 (11 ms)/ 1,000 (media)	+10° to +30°	$1,225 (SRP)
Loral Federal Systems-Owego, 1801 State Route 17C, Owego, NY 13827, (607) 751-2633, (607) 751-2597 Circle 115									
3.5-in. space qualified	0661-467S	400	11.5 (avg)/ 20 (max.)	1.7	79,000	17	20 (11 ms), 2,500 (non-oper.)	-55° to +55°	Contact Loral
3.5-in. rugged removable	0663-E15R	1206	9.8 (avg)/ 18.5 (max.)	2.2	75,000	17	Same as above	-55° to +71°	Contact Loral
3.5-in. rugged removable	DFHS-S2FR	1120/2250	7.8 (avg)/ 19 (max.)	7.0	83,000	17	Same as above	-55° to +71°	Contact Loral
2.5-in. rugged removable	DHAS-2540R	344/540	14 (avg)/ 23 (max.)	2.5	50,000	17	15 (11ms) 2,500 (non-oper.)	-55° to +71°	Contact Loral

MIL-SPEC AND RUGGED MAGNETIC DISK DRIVES

Type	Model	Useable capacity (Mbytes)	Maximum access time (ms)	Average sustained data rate (Mbytes/s)	MTBF (hrs)	Vibration (Grms)	Shock (G)	Operating temperature (°C)	Price
Mass Memory Systems, Inc., 1414 Gay Drive, Winter Park, FL 32789 (407) 629-1081 Circle 116									
3 1/2-in. Fast SCSI-2	Disk Pack	525	10	10 (ext. transfer rate/sync.)	200,000	8 (non-oper.)	300 (non-oper.)	+5° to +55°	$1,095
3 1/2-in. Fast SCSI-2	Disk Pack	1.05 Gbytes	9.0	Same as above	500,000	4 (non-oper.)	200 (non-oper.)	Same as above	$1,469
3 1/2-in. Fast SCSI-2	Disk Pack	1.6 Gbytes	8.0	Same as above	350,000	4 (non-oper.)	200 (non-oper.)	Same as above	$1,795
3 1/2-in. Fast SCSI-2	Disk Pack	2.1 Gbytes	8.0	10 Mbytes/s (sync)	500,000	4 (non-oper.)	200 (non-oper.)	Same as above	$3,109
Miltope Corporation, 500 Richardson Road South, Hope Hull, AL 36043 (205) 284-8665, FAX, 613-6302 Circle 117									
3.5 in.	RD2000	2,537	35	2.94	150,000	4	10	-18° to +55°	$7,500
2.5 in.	MD500	524	23.2	1.5	75,000	2.5	3 (5 ms): 2 (11ms), 1 (20ms)	-18° to +55°	$4,150
MountainGate Data Systems, Inc., 9393 Gateway Drive, Reno, NV 89511-8910 (800) 556-0222 Circle 118									
3 1/2-in. removable	IncreMeg	245 Mbytes to 2.1 Gbytes	9-12	8-9 (IDE); 10 (sync.)	200,000 to 550,000	—	10 (oper.)	+10° to +45°	$956 to $3,563
5 1/4-in. removable	DataShuttle 1000	760 Mbytes to 3.5 Gbytes	12-15.5	4.7 to 10.0 (sync.)	150,000 to 300,000	—	10 (oper.)	+10° to +45°(oper.)	$3,575 to $6,125
3 1/2-in. removable sub system	IncreMeg 6000	12.7 Mbytes to 12 Gbytes	9.0-12.0	10 (sync.)	200,000	—	10 (oper.)	+10° to +45°	$3,000 (chassis)
Sub system: Four 3 1/2-in. Winchesters	3500	525 Mbytes (single); 71.6 Gbytes (four)	10.5 (ave. seek)	2.5 to 20	25,000	7.7 (oper.)	15 (11 ms) (oper.)	0° to +50°	$19,000 to $48,750
Raymond Engineering Inc./Kaman, 217 Smith Street, Middletown, CT 06457, (203) 632-1000, fax, (203) 632-4567 Circle 119									
3 1/2 in. Full-mil magnetic disk	84300	300	18 (ave.)	1.2	15,000	13.5	60 (6ms)	-55° to +95°	Contact Raymond
3 1/2 in.space-qualified magnetic disk	—	2.0 Gbytes	18 (ave.)	5	12-year mission life	Launch	PyroShock	-55° to +95°	Contact Raymond
3 1/2 in. ruggedized magnetic disk	841000R	1.0 Gbyte	12 (ave.)	5	80,000	Per-Mil-Std-810	Per Mil-Std-810	-40° to +65°	Contact Raymond
2 1/2 in. ruggedized magnetic disk	84260R	260 Mbytes	15 (ave.)	5	100,000	Per-Mil-Std-810	Per Mil-Std-810	-40° to +65°	Contact Raymond
Recognition Concepts, Inc., 5200 Convair Drive, Carson City, NV 89706, (702)882-7817, fax (702) 882-5381 Circle 120									
Disk Array 3.5 in. SCSI-2	RDR1081M	8 Gbytes	25	16	500,000 POH	0.5 (oper.) 1.0 (non-oper.)	10 (oper.) 60 (non-oper.)	+5° to +45°	$36,200
Disk Array 3.5 in. SCSI-2	RDR4161R	230 Gbytes	25	192	500,000 POH	Same as above	Same as above	+5° to +45°	$446,500
Disk Array 3.5 in. SCSI-2	RDR8161R	460 Gbytes	25	384	500,000 POH	Same as above	Same as above	+5° to +45°	Call

MIL-SPEC AND RUGGED MAGNETIC DISK DRIVES

Type	Model	Useable capacity (Mbytes)	Maximum access time (ms)	Average sustained data rate (Mbytes/s)	MTBF (hrs)	Vibration (Grms)	Shock (G)	Operating temperature (°C)	Price
Rugged Digital Systems, 8966 Comance Avenue, Chatsworth, CA 91311 (818) 341-2901 Circle 121									
3 1/2 in. SCSI	R/RZ10D	1 Gbyte	9.5	2.7-5.5 Gbytes	500,000	2.0g., 50-2,000 Hz	20 g, (11 ms), 1/2 sine	0° to +50°	$3,654
3 1/2 in. SCSI	R/RZ16D	1.6 Gbytes	10.0	2.4-4.9 Gbytes	300,000	2.0g., 50-2,000 Hz	20 g, (11 ms), 1/2 sine	0° to +50°	$3,921
3 1/2 in. SCSI	R221D	2.1 Gbytes	10.0	2.7-5.5 Gbytes	500,000	2.0g., 50-2,000 Hz	20 g, (11 ms), 1/2 sine	0° to +50° (-20° optional)	$4,716
Ruggedtronics, Inc., 24711 Redlands Blvd., Suite G, San Bernardino, CA 92408 (909) 796-5374 Circle 122									
Ruggedized	R3	80 to 2,100	21	5	200,000	5.6	30 (11ms)	-10° to +85°	Dependent on drive capacity
Sealed	S3	80 to 2,100	21	5	200,000	5.6	Same as above	-20° to +85°	Same as above
Hermetically sealed	H3	80 to 2,100	21	5	200,000	5.6	Same as above	-40° to +55°	Same as above
Spectrum Astro, Inc., 1440 N. Fiesta Boulevard, Gilbert, AZ 85233-8366 (602) 892-8200, fax, (602) 892-2949 Circle 123									
—	EDMM	8,580	18	10,000	250,000	15	75	10°	Call for quote
—	EDMM-R	1,020	20	9,000	250,000	15	300	10°	Call for quote

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Military optical storage fights an uphill battle

With demand for full mil-spec on the wane, the Department of Defense is turning to off-the-shelf optical storage devices to fill the gap.

Despite the gains optical storage technology has made in commercial applications, it is finding the military market a tough nut to crack. One large supplier of data systems to the government and military markets, Sundstrand (Rockford, Ill.), dropped its optical storage offering in 1991 after realizing there was only a handful of customers for a drive it developed for the F-16. With Sundstrand out, only three major suppliers remain: Mountain Optech Inc. (Boulder, Colo.), Lockheed Corp.'s MountainGate Data Systems Inc., formerly Cherokee Data Systems (Longmont, Colo.), and Miltope Corp. (Melville, N.Y.).

Sundstrand's decision to exit the military optical drive market confirms the belief held by some industry insiders that a growing number of military customers are no longer willing to spring for full mil-spec storage products. Cost, availability, and the flexibility to integrate commercially available peripherals are the primary reasons that requests for proposals (RFPs) are specifying commercial-off-the-shelf (COTS) products rather than mil-spec, said Jerry Hermes, director of the Systems Integration and Planning Services at Information Strategies Group (Vienna, Va.), a market research firm specializing in technology for the U.S. military.

Many government and military users are choosing non-mil-spec drives when they can, Hermes said, because commercial- and industrial-grade components meet many of the shock, vibration, and temperature requirements users' systems actually experience. Vendors and analysts agree that mil-spec optical subsystems generally run in the $70,000 to $80,000 range, whereas a rugged or industrial-grade system—a step above commercial— can range from $5,000 to $18,000, depending on the enclosure. Given today's budget constraints, it is neither necessary nor cost-effective to "overkill" every application with mil-spec drives, he noted.

> **"Given today's budget constraints, it is neither necessary nor cost-effective to 'overkill' every application with mil-spec drives."**
>
> —Jerry Hermes
> Information Strategies Group

Mil-spec optical systems are costly, in part, because of the need to install customized ground stations and primary host systems. With proprietary optical subsystems and some mil-spec systems, expensive hardware has to be installed both at the field location and at the host system where the data is analyzed. With COTS, Hermes says, less expensive commercial-grade peripherals can be used for the host systems, dramatically reducing the overall cost of optical technology.

Glass vs. polycarbonate

Although optical media for all of the drives are available with either a polycarbonate or glass substrate, only glass is specified for rugged and mil-spec drives. Glass is a more fragile substrate, which can be an advantage in military applications. For security purposes, glass media are easier to destroy than polycarbonate, which has a greater tendency to scratch. Polycarbonate media are more likely to be damaged if left under a hot laser for extended periods of time. Under some circumstances, it is possible for the plastic media to melt, effectively causing data loss. Glass media will become hot but are less likely to be damaged by the laser.

Miltope's Laub notes that glass media also have a longer life expectancy than polycarbonate. Glass media can last 25 years, whereas polycarbonate media are only expected to last 10 years.

Despite the lack of funding for some military programs, all three vendors believe that optical storage technology is here to stay in the military marketplace.

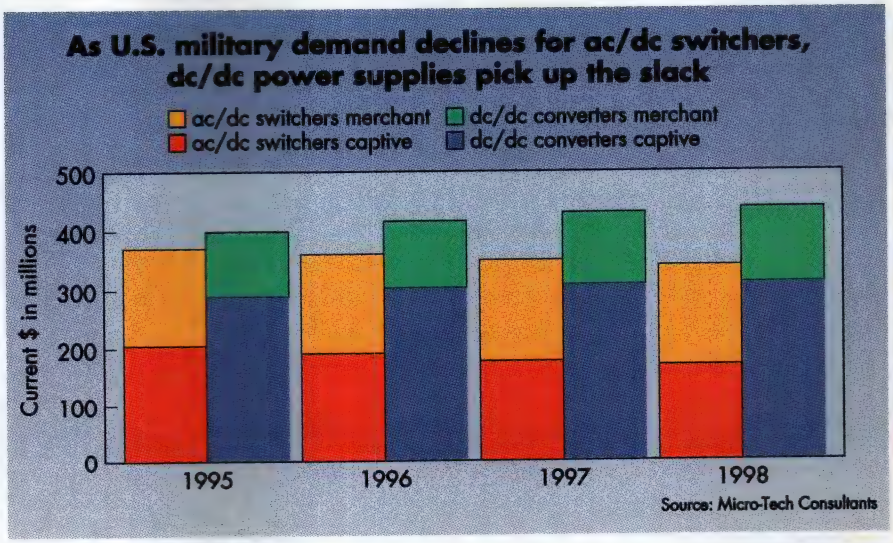
Although Miltope expects the technology to remain a small percentage of its business, Mountain Optech and MountainGate are expecting revenues to rise for military and rugged drives. However, both firms remain cautious. They continue to promote their commercial- and industrial-grade drives for non-military applications. **M&AE**

MIL-SPEC AND RUGGED OPTICAL DISK DRIVES

Model	Capacity	Interface	Access time	Data transfer rate	MTBF (hrs)	Temperature range (°C)	Operating shock	Vibration (G)	Mil-specs	Price	Comments
Fiberoptic Switch, Inc., 35 Rockland Rd., Norwalk, CT 06854 (203) 838-7500, fax (203) 838-2566 Circle 129											
OSD	Switch	A/D	25 ms	Light	100,000	-40° to +85°	As required	As required	n/a	$2,500 single unit	Solid, no moving part optical switch
CID/CIN	Attenuator/ Shutter	A/D	1 ms	Light	100,000	-40° to +85°	As required	As required	n/a	$50/@ 100 pcs.	Solid or liquid crystal element
Miltope Corp., 500 Richardson Rd., Hope Hull, AL 36043 (205) 284-8665, fax (205) 613-6302 Circle 130											
ODS6500	650 MB/1 GB/1.3 GB	SCSI-2	18.9 ms and latency	3 Mbyte/s async, 5 Mbyte/s sync	25,000	-15° to +55°	15 G, 11 ms	0.10" DA to 20 Hz, 2 G's 20-2000 Hz	n/a	$16, 950	—
Mountain Optech, 4775 Walnut St., Ste. A, Boulder, CO 80301 (303) 444-2851, fax (303) 444-4431 Circle 131											
SI-250	230 MB	SCSI-2	<40 ms plus latency	2.5 Mbyte/s async, 5 Mbyte/s sync	40,000	-40° to +85°	15 G	10 G rms	5400T, 167	$3,695	—
SE-250	230 MB	SCSI-2	<40 ms plus latency	2.5 Mbyte/s async, 5 Mbyte/s sync	40,000	-40° to +85°	30 G	9 G rms	5400T, 167	$4,995	—
SE-1000 Rev. 3	1.3 GB	SCSI-2	27 ms	3 Mbyte/s async, 5 Mbyte/s sync	>100,000	-20° to +55°	30 G	13 G rms	5400T, 461/462, 167	$15,295	—
ST-250	230 MB	SCSI-2	39 ms plus latency	5 Mbyte/s	40,000	-40° to +85°	9 G	6 G rms	5400T, 167	$3,795	—
ST-1000 Rev. 3	1.3 GB	SCSI-2	27 ms	3 Mbyte/s async, 5 Mbyte/s sync	>100,000	-20° to +60°	30 G	4 G rms	5400, 167	$4,995-$7,995	—
SS-1000 Rev. 3	1.3 GB	SCSI-2	27 ms	3 Mbyte/s async, 5 Mbyte/s sync	>100,000	-20° to +55°	30 G	13 G rms	5400, 167	$10,715	—
Mountain Gate Data Systems, Inc., 9393 Gateway Dr., Reno, NV 89511-8910 (702) 851-5553 Circle 132											
Pathfinder Worm Drives	650 MB	SCSI, asynch, single-ended	105 ms (avg.) 16.7 ms latency (avg.)	Sustained 694 kbyte/s, burst 2.5 Mbyte/s	20,000	-20° to +55°	Operating 15 G/11 ms half sine	Sinusoidal: Mil-5400T, curve III A; Random: Mil-810-E, category 10	Mil-Std-461C	$8,500-$40,000	CR 6835/36 holds 1,022 drives

Ac/dc switchers face tough prospects in mil/aero market

Budget cuts and an industry-wide move to distributed power are forcing makers of military ac/dc switching power supplies to re-evaluate their long-term strategies.



The shift to distributed power architectures in military hardware is redefining the power supply market and is casting a shadow over the future of the centralized ac-to-dc switching power supply. Distributed architectures are attractive for many reasons: increased system versatility and upgradability, simplified maintenance and repair, and helping the services meet their needs for local regulation of logic-level power. So it's not surprising that demand for dc/dc converters is expected to grow significantly over the next few years, while the market for traditional ac/dc switchers looks bleak.

According to Micro-Tech Consultants (Santa Rosa, Calif.) U.S. demand for ac/dc power supplies will shrink at a 1.85 percent-a-year rate through 1996, led by a merchant segment that will decline by 3.0 percent a year.

Still a big market

Despite their shrinking share of market, however, traditional ac/dc switchers still represented nearly $400 million of the $744 million military power supply market last year, according to Micro-Tech Consultants. So while the outlook is hardly rosy, manufacturers can expect to sell ac/dc power supplies into a wide range of military and aerospace applications for a long time to come, particularly at power levels above 1 kW.

Unlike many commercial markets, the military's inventory of platforms and hardware that use ac/dc switchers will need updating and service for years to come.

One application area that offers multiple examples of innovation in the ac/dc power supply market is military avionics. Despite the move to distributed architectures on newer airframes, vendors are still building innovative, compact ac/dc supplies for aircraft applications.

Fault-tolerant and mission-critical applications also remain a strong suit for traditional ac/dc power supplies.

Focus on cost

As it has in every other aspect of military design, cost has become a critical factor in the power supply market. In fact, one argument for the move to distributed architectures, aside from the low cost of dc/dc modules, is their ability to lower nonrecurring engineering expenses. While some DoD efforts—like the Standard Power Supply Program—have tried to lower cost by standardizing military power supply design, most of the emphasis today is on the use of commercial off-the-shelf (COTS) products.

Of course, industrial vendors eyeing prospective business opportunities in the military market argue that commercial off-the-shelf power supplies offer a number of advantages besides lower cost.

Quite a few established power supply manufacturers see potential hazards in the military's new focus on cost, however. Their obvious concern is that the new emphasis on cost of acquisition will come at the expense of reliability.

In the meantime, manufacturers of ac/dc switchers who haven't already done so are quickly developing dc/dc converter product lines, as few vendors can afford to overlook the one bright spot in an otherwise gloomy military power supply market. M&AE

AC/DC POWER SUPPLIES

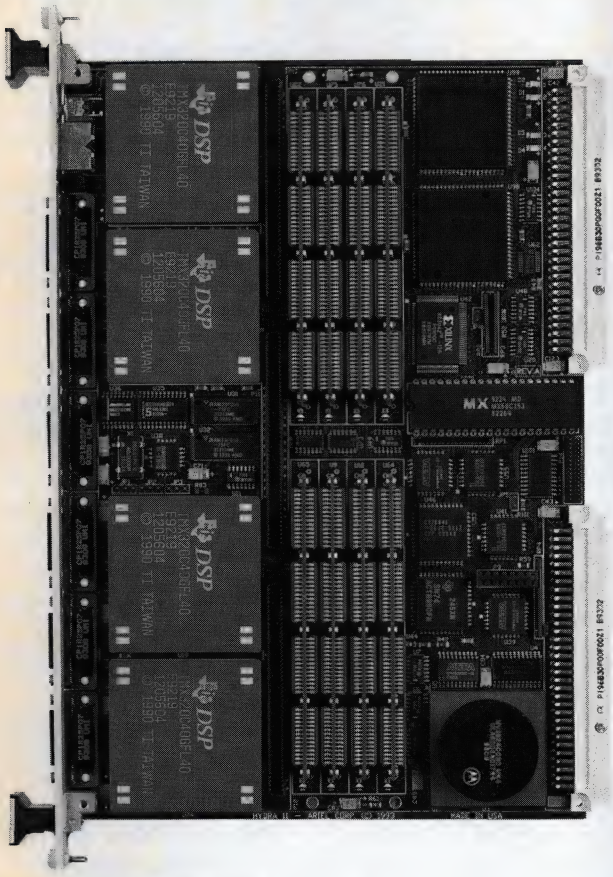
Model	Input voltage (V_{ac})	Output voltage (V_{dc})	Maximum load current per output (mA)	Maximum output power per output (Watts)	Efficiency at full load typical (%)	Out volt ripple at full load	Out volt tolerance (±%)	Line regulation (%)	Military specifications	Comments
Abbott Electronics, Inc., 2727 S. La Clenega Blvd., Los Angeles, CA 90034 (310) 202-8820, fax (310) 836-1027 Circle 138										
AM Series (20 models)	115/220, 60 Hz	5,5.2,12, 15,24,28	20 - 1.79A (depends on output)	50,100,200	75	25 mV rms @ 5Vout; 50 mV (all others)	<0.1 or 10 mV	0.1	Mil-Std-704, -1399,-461C, -810D,-901C	±12,±15V dual output available; Mil-Std-2000 versions available in all power ranges
AW Series (34 models)	115, V400 Hz	Same as above	40 - 0.71A (depends on output)	20,35,50, 100,200	70 to 80	Same as above	Same as above	0.1	–	Same as above
RW Series (34 Series)	115, V400 Hz	Same as above	Same as above	Same as above	70 to 80	Same as above	Same as above	0.1	None	Same as above
Arnold Magnetics Corp., 4000 Via Pescador, Camirillo, CA 93012 (805) 484-4221, fax (805) 484-4113 Circle 139										
EL Series	115V 10; 115/230V, 47-500 Hz	2 - 300	10mA - 110 A	600 W	80 to 90	0.1 to 0.4%	±5 (adj.)	0.1	Mil-Std-810, -461, & more	-55° to +100° C, single or multioutput
PB Series	115V 10; 120/208V 30 47-500 Hz	24-270	2 to 22 A	600 W (n+1)	80 to 90	0.15%	±5 (adj)	0.1	Same as above	-55° to + 100° C, low profile, power factor corrected
Ascent Power Technology, Inc., 146 Adesso Dr., Concord, Ontario L4K-3C3 (905) 660-9819, FAX (905) 660-9567 Circle 140										
Custom low voltage	85 to 264	2 - 500	500 A	50W-3kW	75 (typ.)	0.1 to 10%	0.1 to 5	0.1	Mil-I-45208, Mil-Std-704, 461,810 Mil-Std-2000	Power factor correction (0.99) available; custom enclosures, alarm circuits
Custom high voltage	85 to 264	500 V to 100 kV	Variable	500	75	1 to 10%	Same as above	0.1	Same as above	dc input volt available
ATC Power Systems, Inc., 45 Depot St., Merrimack, NH 03054 (603) 429-0391, fax (603) 429-0795 Circle 141										
ACU/Powerstep	115/230	Single output; 5, 12, 15, 28	5@30	Up to 350	82	1%	1	0.5	Mil-Std-704, -810	Options; hi-rel, Mil-Std-461
ACU/Powerstep	115/230	Dual output; 5, 12, 15, 28	5@30/5@30	Up to 175W/ output	82	1%	1	0.5	Same as above	Same as above
PBUN/Powercq	115/230	2 -5 outputs	5@7, 12@3.3, 15@3.3, 28@2.5	200	76	1%	1	0.5	Mil-Std-461C, -704, -810	Options; hi-rel
Custom	115/230	5, 12, 15,28	–	Up to 1kW	80	1%	1	0.5	Mil-Std-704, -810	Options; hi-rel,Mil-Std-461, custom enclosure
Engineered Magnetics, 18435 Susana Rd., Rancho Dominguez CA 90221 (310) 635-9555, fax (310) 631-0313 Circle 142										
EMTR 250 A	115/200, 400 Hz, 30	Multiple (8): ±5, ±12, ±18, +75, 5.5V	Various: 0.1-18.5A	Total: 500	70	50 mV	–	1	Mil-Std-704A, -461	Built-in test, test points
EMTR 217	115/230 ±10%, 10, 50,60 or 400 Hz	28V (adj. 24-32)	25A (adj. 0-25A)	800	75	250 mV	–	1	Same as above	Front-panel controls, EMI Mil-Std-461
EMPS 500	120 ±15%, 1-0, 60 Hz	28V	50A	1,400	82	120 mV	–	2	Same as above	Standard 19-in. rack mount
Lambda Electronics Inc., 515 Broadhollow Rd., Melville, NY 11747 (516) 694 -4200, fax (516) 752-2627 Circle 143										
LZS-Series	115/230 (autoselectable)	4 voltage ranges avail.; 4.5 - 52V	To 300A	50 - 1,500	70-75	For 5V output; 10 mVRms, 35 mvp-p	0.1 (load reg.)	0.1	Mil-Std-810E, -461D	22 models available from stock

AC/DC POWER SUPPLIES

Model	Input voltage (V_{ac})	Output voltage (V_{dc})	Maximum load current per output (mA)	Maximum output power per output (Watts)	Efficiency at full load typical (%)	Out volt ripple at full load	Out volt tolerance (±%)	Line regulation (%)	Military specifications	Comments
Lambda Electronics Inc., 515 Broadhollow Rd., Melville, NY 11747 (516) 694 -4200, fax (516) 752-2627 Circle 143 *(continued)*										
SE-Series	105- 140; surge to 170 for 1 sec.	4 voltage ranges avail.; 4.5 - 52V	To 300A	50 - 1,500	70-75	For 5V output; 10 mVRms, 35 mvp-p	0.1 (load reg.)	0.1	Mil-Std-2036, -810E, -461D	22 models available from stock
Logitek, Inc., 101 Christopher St., Ronkonkoma, NY 11779 (516) 467-4200, fax (516) 467-4090 Circle 144										
PSX2S/PSX50	115/220; 10, 30; 47-440 hZ	3.3 - 28	7.5-0.9A/ 15.1-2A	25/50	75	50mVp-p	1	±0.1	Mil-Std-704A, -810C, -461C	Internal EMI, low profile, -55° to 100° C oper. temp
PSX75	Same as above	3.3-48	22.7-1.6A	75	75	100 mVp-p	1	±0.1	Same as above	Same as above
PSX150	Same as above	3.3-48	45.4-3.2A	150	75	100 mVp-p	1	±0.1	Same as above	Same as above
Modular Devices, Inc., One Roned Rd., Shirley, NY 11967 (516) 345-3100, fax (516) 345-3106 Circle 145										
2661	115	2 to 300 (single & duals)	Up to 7.5A	20	76	30 mV (typ.)	Adj.	8 mV (typ.)	Mil-E-5400	Family of 24 output voltages, I/O via mini D connector
2654	90 to 270	24, 39 (chargers)	6.25A	150	82	120 mV	3	3%	Mil-T-28800, Mil-Std-461	Unit has a 24 Vdc output, designed for rugged test sets
2652/2653	115, 30	2652: +5,+1-15; 2653: +5,-5.2,+1-15	30A (2A ea.)/ 40A (4A,2A ea.)	269	75	25 mV	2	20 mV	Mil-E-5400, NAVMAT 4855-1, Mil-Std-461	VME rack compatible, also runs on 270 Vdc
OECO Corp., 4607 S.E. International Way, Milwaukie, OR 97222 (503) 659-9999, fax (503) 653 6310 Circle 146										
20491	115, 60 Hz	±6, +5.5, +16.8, -16.8	340, 1,700, 2,500, 4,200	–	–	–	–	–	Mil-E-5400	-
20434	115, 60 Hz	+26	22,000	572	69 (min.)	–	5	–	Mil-E-16400, DoD-Std-1399, Mil-Std-202,-461,-461,-810	Power factor and harmonic correction, shipboard application
20432	115, 60 Hz	+5	40,000	200	65 (min.)	–	2	–	Same as above	Same as above
20636	115, 400 Hz, 30	4 outputs; 150	2,500	375	–	–	–	–	–	High-power factor, aerospace application
20548	115, 400 Hz, 30	3 outputs; 28	53, 570, 29, 460, 24, 100	675, 825, 1,500	80	100 mVp-p	1.8, 2.7%	–	Mil-Std-2000	Also dc inputs aerospace application
Pico Electronics, 453 N. MacQuesten Pkwy, Mt. Vernon, NY 10552 (914) 699-5514, fax (914) 699-5565 Circle 147										
10AC5S	90-130	5	2,000	10	75	50 mVp-p	0.5	0.2	Mil-Std-704D	Low-profile 0.500-in. height
50AC28S	90-130	28	1,964	55	86	50 mVp-p	0.5	0.2	Mil-Std-883 (selected)	No heat sink or electrical derating required
H5AC12D	170-240	±12	209	2.5	75	50 mVp-p	0.5	0.2	Mil-Std-704D	Optional -55 to +85 C available
Powercube Corp., 8 Suburban Pk. Dr., Billerica, MA 01821 (508) 667-9500, fax (508) 667-6280 Circle 148										
UNV300 1A, 1M	85-265 VAC 10	0300 VDC (nom.)	–	720	97	–	–	–	Mil-Std-704	AC-DC front-end; external filter caps req'd.; VDE, UL, CJA in process

AC/DC POWER SUPPLIES

Model	Input voltage (V_{ac})	Output voltage (V_{dc})	Maximum load current per output (mA)	Maximum output power per output (Watts)	Efficiency at full load typical (%)	Out volt ripple at full load	Out volt tolerance (±%)	Line regulation (%)	Military specifications	Comments
Powercube Corp., 8 Suburban Pk. Dr., Billerica, MA 01821 (508) 667-9500, fax (508) 667-6280 Circle 148 *(continued)*										
ADF/ALDFX	95-132 VAC 10	155 VDC (nom.)	–	45-150	95/93	–	–	–	Mil-Std-704	AC-DC front end, no external caps required, in rush limted
ADF/ALDFXX	95-132 VAC 10, 30	155 VDC (nom.)	–	300 & 500	98/90	–	–	–	Mil-Std-704	SC-DC front end; no external caps required; in rush limited
Rantec Microwave & Electronics, Inc., 24003 Ventura Blvd., Calabasas, CA 91302 (818) 591-8189, fax (818) 876-0324 Circle 149										
HD7530	200 V_{L-L}, 400 Hz 30	5, 12, 15, 24 or 28	15A	75	78	75mV or 0.5% (pk-pk max.)	–	±1 max.	Mil-Std-704D, -810, -901, 461C	Low profile (0.5), full mil-qualified, full EMI protected
HD30030	Same as above	Same as above	60A	300	80	Same as above	–	±1 max.	Same as above	Same as above
HD7530D	Same as above	±12V or ±15V	±3A	75	68	50 mV	–	±1 max.	Same as above	Same as above
Sierra West Power Systems, Inc., 300 N. Telshor Blvd., Ste. 500, Las Cruces, NM 88011 (505) 522-8828, fax (505) 522-8828 Circle 150										
SW115-5d 15-160	110/220	+5, +15, -15	20A, 2A, 2A	100, 30, 30	80	50 mVp-p/ 100mVp-p	0.5, 0.2, 0.2	0.1, 0.1, 0.1	Mil-C-901C, Mil-Std-167-1, -461, -801C	Also available in UPS model, dc input and ac input
SWAC100 -5-20	110/220	5	20A	50	75	50mV	0.5	0.1	Same as above	Fits standard 2.4x4.6-in. footprint
Tecnetics, Inc., 6287 Arapahoe Ave., Boulder, CO 80303 (303) 442-3837, fax (303) 444-9437 Circle 151										
4200 Series	92-126, 400 Hz, 30	Single: 5, 15, 28	Single: 5 @40,000	200	87 (single)	150 mVp-p	0.4	±0.2	Mil-Std-8100D, -461, -704	Airborne application, triple outputs available
8100 Series	102-124, 30, 400Hz	Single: 5, 12, 15	Single: 5 @20,000	100	80 (single)	100 mVp-p @5Vdc	1	±0.5	Same as above	Single, dual, triple outputs available, airborne application 10W/in3
71101	115, 400Hz, 30	5.3 (others avail.)	66,000	350	75	100 mVp-p	1	±0.5	Same as above	Modular design for field repair, BIT
71128	117, 30, 400 Hz	7 (isolated)	1,000-45,000	1,500	80	1% p-p (typ.)	1	±0.5	Same as above	Rack mounted, forced air cooled
71184	Universal AC/28 Vdc	8 (5-48)	1,000-45,000	475	75	1% p-p	1	±0.1	Mil-Std-1275, -461, -801D	Power factor correction, rack mounted, conduction forced cooled
Transchem, P.O. Box 667, Corona, CA 91718-0667 (909) 371-5751, fax (909) 371-9602 Circle 152										
VM272	115 VAC, 10 47-440 Hz	+5, +12, -12	40A@+5, 3A@+12, 3A@-12	272	79	50 mVp-p	±0.5	±0.5	Mil-Std-704E, -810D	6x9x1.97-in. ATR & VME compatible
5624	115 VAC, 30 400 Hz	+5, +28	2.6A@+5, 1.7@+28	60	70-80	20 mVp-p(+5)	±0.5	±0.5	Mil-E-5400, Mil-Std-810D	6x9x1.8 -in. voltage adjust
Transistor Devices, Inc., 85 Horsehill Rd., Cedar Knolls, NJ 07927 (201) 267-1900, fax (201) 267-2047 Circle 153										
BCE-3K	96-264 autorange	+28, +48	3kW	3,500	88	300 mV (max.)	1	0.25	Mil-Std-810E	Available with battery backed ups
BCE-6K	174-264	+28, +48	6750	7200	88	500 mV	1	0.5	Same as above	Available with 6kW DC-AC inverter
MPS	96-264	+5, ±12, ±24, ±48	3KW module	3kW	85	500 mV	2	0.5	Same as above	Modular mix and match



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- *Dual 100 Mbyte/second accessible C40 buses*
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PRODUCT INFORMATION

Hydra-II is the latest-generation dual- or quad-DSP system based on the Texas Instruments TMS320C40. With up to 32 Mbytes of zero-wait-state SRAM, Hydra-II's architecture is optimized for the highest possible performance and lowest system cost.

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HYDRA-II SYSTEM SPECIFICATIONS

PROCESSOR • Two or four Texas Instruments C40 DSPs
STATIC MEMORY • Dual processor: 256 Kbytes standard, expandable up to 16 Mbytes. Quad processor: 512 Kbytes standard, expandable up to 32 Mbytes. Memory is divided evenly among all processors.
DUAL-PORT MEMORY • 32 Kbytes
FLASH MEMORY • 128 or 512 Kbytes user-accessible flash EEPROM.
COMMUNICATION PORTS • Twenty-four 20 Mbyte/second interfaces. Up to 16 communication ports are accessible externally. Available configurations provide front-panel connectors for 6, 12 or 16 communication ports.
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VSB BUS • Optional VSB master interface on VME P2 connector.
DEBUG PORT • JTAG P1149.1 boundary scan with extensions for in-circuit emulation. Available on the VMEbus and also via an on-board 14-pin header for direct connection to Ariel's UXDS or Texas Instruments XDS-510 remote debuggers.
RS-232 PORT • Single port accessible on front panel. 150 baud to 19.2 Kbaud.
HOST INTERFACE • 6U VMEbus, slave, dual-port memory interface. Memory-mapped to 128 Kbytes in VMEbus memory space. Host interrupts and DMA are supported.
POWER • 2.5A at 5V typical for dual processor. 3.3A at 5V typical for quad processor.
SIZE AND WEIGHT • 262 x 187 x 21 mm overall, 590 grams. 10.3" x 7.4" x 1.1" overall, 1.12 lbs.

SOFTWARE SPECIFICATIONS

C and Ada development tools: compilers, assembler, source-level debuggers, simulator, DSP libraries; DSP operating systems, and graphical programming tools.

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DSPs break through technology roadblocks

Thanks to new designs and better performance, digital signal processors are gaining ground on analog ICs in applications that have not used DSPs before.

The market for worldwide digital signal processors (DSPs) is expected to quadruple during the next four years. While the military DSP market represents only an estimated 5 percent of the worldwide total, DSP use in defense applications is expected to grow at least at the rate of the total market, experts say.

A report by Robert Castellano of the Information Network in Williamsburg, Va., estimates that today's $1.8 billion DSP market will increase to $5.9 billion by 1998. "We expect the DSP market to establish a more aggressive posture for growth in the future by developing more product standardization, second sourcing, software, and application support," the report says.

Indeed, DSPs represent "an area that nobody is abandoning," quips Will Strauss, a market analyst at Forward Concepts in Tempe, Ariz. DSP industry leaders, including Dallas-based Texas Instruments and Motorola Government Electronics Group in Phoenix, plan to continue serving the military DSP market, although Motorola officials have told Strauss that they're planning in the long term to expand their commercial DSP work.

Bert McComas, chief technical officer at In-Stat, a market research firm in Scottsdale, Ariz., says the military and civil DSP markets are still quite different. "In the consumer market, the fixed point 16-bit will satisfy a lot of needs for a long time into the future, whereas in the military, it's a lot different because you'll have a lot more floating point stuff going on, image stuff, and not a lot of it is reusable to the consumer marketplace directly."

He cautions against over-expectation that DSPs will be a panacea for all kinds of complex processing challenges. "We're on the cusp of more logic integration, not yet mixed signal integration," he says, adding that DSP technology is still changing too rapidly to be integrated with mixed signal analog functions. He says DSPs can, however, be integrated with digital system logic functions because the two technologies share many of the same design rules.

"We expect the DSP market to establish a more aggresive posture for growth in the future by developing more product standardization, second sourcing, software, and application support."

—from "Fourth Generation DSPs," a report by Robert Castellano, of Information Network, Williamsburg, Va.

Information Network's report, entitled "Fourth Generation DSPs: Products, Applications, Markets," points out that DSPs may not be only for niche markets anymore. "The price of DSPs has fallen and gained so much functionality that it may be considered a viable general purpose embedded processor as well," the report states. "Initial prices of DSPs such as TI's 320C120, when introduced in 1982, were $500. Today, prices have dropped below $4 for single-unit purchase."

According to Castellano, DSPs have seven primary applications that have widespread military and civil uses: voice and speech processing, image and graphics processing, instrumentation, remote sensing, process control, testing and inspection, and computer design. Castellano's report also says that designers are using multiple general-purpose DSP chips in graphics accelerators and multimedia hardware.

Based on current activity, the prospects are good for digital signal processors in both military and commercial systems. Most important for DSP vendors is that their chips are being designed into products that have traditionally used general-purpose microprocessors, including automotive systems and a variety of multimedia applications.

Worldwide, demand for general-purpose DSPs will more than double over the next few years, growing from $990 million this year to $2.48 billion by 1997, according to Forward Concepts. The military general-purpose DSP worldwide market is being swept along in the current; it will almost triple from $36 million this year to $91 million in 1997.

Big winners in DSPs, especially in the military, are floating-point chips. Compared to commercial designs that use two to three floating-point processors per design, the military is driving floating-point processor technology. According to Strauss, every military design contains an average of eight floating-point processors, and each floating point application is heavily multiprocessor oriented.

Application-specific DSPs

Besides the traditional general-purpose DSP market, several companies design application-specific DSPs for the military market. Frequently, a DSP needs to be turned up a notch to get better performance for applications like image processing and real-time video compression. In these cases, application- or function-specific DSPs are needed in addition to a general-purpose DSP in order to achieve better performance. M&AE

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CIRCLE 7 ON READER SERVICE CARD

GENERAL-PURPOSE DIGITAL SIGNAL PROCESSORS

Part number	Cycle time (ns)	Multiply and accumulation	Internal program memory (RAM)	External memory	Internal data memory (RAM)	Internal program cache (word)	External data RAM	Data ROM	Comments
Analog Devices, Inc., Three Technology Way, Norwood, MA 02062-9106 (800) 262-5643 Circle 159									
ADSP2101	50	1 Cycle	2k x 24	14k x 24	1k x 16	—	14kx16	—	16-bit, fixed-point w/2 dbl buffered serial ports in 68-pin PLCC or PQFP
ADSP2103	98	1 Cycle	2k x 24	14k x 24	1k x 16	—	14kx16	—	3.3-volt fixed-point, <65mW, for portable/ battery applications in 68-lead PLCC/PQFP
ADSP2105	72	1 Cycle	1k x 24	14k x 24	.5k x 16	—	14kx16	—	low-cost, fixed-point w/ 1 serial port in 68-lead PLCC
ADSP2171	30	1 Cycle	2k x 24	14k x 24	2k x 16	—	14kx24	8kx24	Highly integrated low-cost, 33 MIPS fixed-point in 128-lead TQFP/PQFP
ADSP2181	30	1 Cycle	16k x 24	14k x 24	16k x 16	—	14kx24	—	Highest performance fixed-point, 1024-point FFT in 1 ms, sleep mode in 128-lead TQFP/PQFP
ADSP21020	30	1 Cycle	—	16mx	—	32x48	4GX	—	33 MHz 32-bit, floating-point in 223-pin PGA
ADSP21060	25	1 Cycle	80k x 48	16mx	128k x 32	32x48	4GX	—	SHARC, 32-bit, 40 MIPS floating-point w/ dual data addressing in 240-lead thermal PQFP
ADSP21062, SHARC	25	1 Cycle	40k x 48	16mx	64k x 32	32x48	4GX	—	Low-cost SHARC, 32-bit, 40 MIPS floating-point, w/ dual addressing in 240-lead thermal PQFP
Intel Corp., 5000 W. Chandler Blvd., C10-82, Chandler, AZ 85226 (800) 344-2280 Circle 160									
80860XR	25	1 clock	none	32 bits wide	8 kbytes cache	4 kbytes	64 bits wide	none	Mil-Std-883, 3-D graphics unit
80860XP	25	1 clock	none	32 bits wide	16 kbytes cache	16 kbytes	64 bits wide	none	3-D graphics unit, IEEE 1149, 1/D6 boundary scan
Texas Instruments, Military Products Division, I-20 & FM 1788, Midland, TX 79711 (915) 561-6500, fax (915) 561-6716 Circle 161									
SMJ320C30	50/60	1 cycle	2 k x 32*	16 M*	2 k x 32*	64 x 32	16 M*	4 k x 32	32-bit floating point, 40 Mflops, SMD has 2nd data bus
SMJ320C31	50/60	1 cycle	2 k x 32*	16 M*	2 k x 32*	64 x 32	16 M*	n/a	Same as above
SMJ320C40	50/60	1 cycle	2 k x 32*	4 G*	2 k x 32*	128 x 32	4 G*	Boot loader	32-bit floating point, highest perf.
SMJ320C50A	40/50	1 cycle	9 kwords	192 kwords	1, 056 words	0	64 kwords	Bootstrap ROM: 2 kwords	16-bit 5th gen. fixed point; full static design
SMJ320C25/SMJ320C 25-50/SMJ320C26	100/80	1 cycle	256 kwords	64 kwords	288 words	0	64 kwords	Pgm. ROM: 64 kwords	16-bit 2nd-gen. fixed point, ROM is maskable
SMJ320C10/SMJ320C 10-25/SMJ320E14	200	1 cycle mult./1 cycle accum.	none	4 kwords	256 words	0	4 kwords	EPROM: 4 kwords	16-bit fixed point with 4 timers, 68-pin PGA and 68 lead CLCC
SMJ320MCM42AHFGM	50/60	.5 cycle	258 k x 32*	4 G*	258 k x 32*	2 x 128 x 32	4 G*	Bootstrap	408 lead CQFP (HFG), 10 external comm. ports
SMJ320MCM41AHFGM	50/60	1 cycle	130 k x 32*	2 G*	130 k x 32*	128 x 32	2 G*	Bootstrap	352 lead CQFP (HFH)
*** Program and data ROM are interchangeable.**									
Westinghouse Electronic Systems, MS A255, P.O. Box 17319, Baltimore, MD 21203-7319, (800) 443-9219, fax (410) 993-8771 Circle 162									
Dual SPE	30 MHz	20 ns	none	128kB	64B	none	Shared w/ external memory	none	Mil/Spec; SIMD processing element; 10-port register file per SPE
Quad SPE MCM	30 MHz	—	—	—	—	—	—	—	Mil/Spec; SIMD processing element; 10-port register file for SPE

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Mil-spec connectors face refinements

Military connector makers meet challenges as mil-specs are refined.

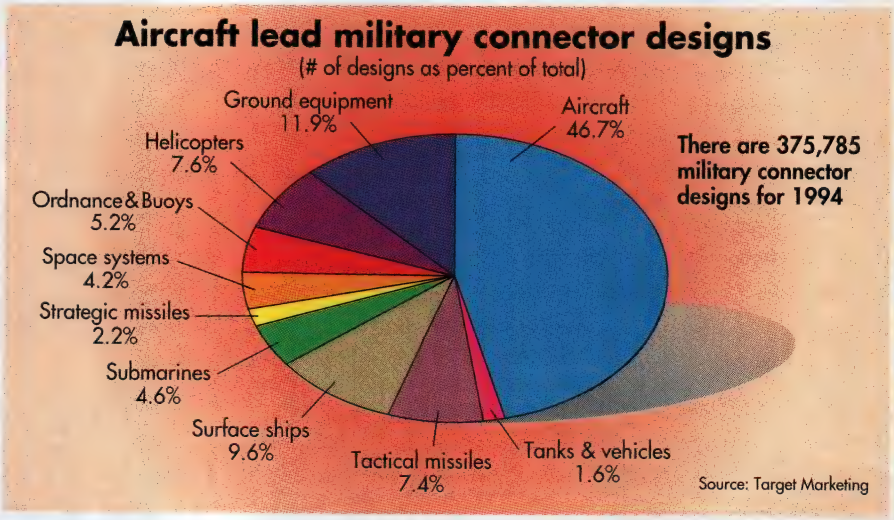
As of last year, over 375,700 connector designs were being used in military platforms, from aircraft to tanks to missiles, ships and submarines. But despite the huge number of designs, the decrease in military spending is still projected to knock the mil-spec connector market down more than 7 percent by 1997, according to Fleck Research (Santa Ana, Calif.), a connector market research firm. While the decline is discouraging news for many vendors, the sheer size of the remaining market offers opportunities for custom mil-spec connector manufacturers to find a lucrative niche.

Opportunities abound on many upgrade and retrofit programs, which are highly electronics dependent. The F-15E Multistage Improvement, for example, uses 2,834 different connector designs, says Dave Trotz, president of Target Marketing (Piscataway, N.J.). The F-18 Hornet uses 2,488 different designs; 1,489 in the C-17; 1,259 in the Apache helicopter; and 1,116 in the V-22 Osprey, reports Trotz, who has taken three years to compile a special database on connectors using data from the Defense Electronics Supply Center (DESC).

The highest growth areas in military connectors are high-density and printed circuit board connectors, Trotz says. In 1994, there were 88,355 printed circuit designs and 58,110 high-density designs. In each case, military aircraft used close to half of the different high-density and printed circuit designs, Trotz says.

Of course, the declining market is only one challenge facing mil-spec connector makers. Some mil-specs are 20 years behind the times of electrical requirements for connectors, says Max Peel, president of Contech Research (Attleboro, Mass.). "That's simply because there's a mindset that says, 'this is the way we've been doing it for 20 years, we don't want to change.' "

But the technology does change. Within a year, DESC will have new specifications and new drawings for some types of connectors, Peel says.



Ground-breaking technology

On another front, Peel predicts that the two different connectors used for the F-22 and the Comanche, as implemented by the Joint Integrated Avionics Working Group, will have a big impact on the market because the technology will be ground breaking. The connectors will allow a mix of signal, power, fiber optics and coaxial on the same connector format.

Recently, mil-spec connector manufacturers have been taking a new look at their market, analyzing ways they can improve manufacturing cost. Typically, the products have extremely low failure rates, and performance is high because of the military specifications and the maturity of the technology. Only recently has the mil-spec connector market become as demanding of its suppliers as the commercial computer and telecommunications markets, manufacturers report.

Freedom and opportunity

Of the 375,000 connector designs determined for 1994, airborne applications represent nearly 50 percent, with 171,500 different designs on board fighters, transports, helicopters, and other types of aircraft, according to Target Marketing reports. No wonder some of the most exciting work is being done for airborne and space applications such as NASA's Space Station *Freedom*.

Fiber-optic connectors saw the biggest growth from 1992 to 1993 of any type of connector, according to Bishop & Associates (West Chicago, Ill.). The nascent market grew 15 percent from $302 million in 1992 to $347 million in 1993. Fiber optics are not expected to capture a large share of the military market for several years.

However, mil-spec connector demand is diminishing, and there may not be any new series of connectors introduced in the near term. Analysts predict that refinements of existing connectors will continue. Peel says pin grid array packaging will take off in the military market as it has done in the commercial world. "It's a whole new marketplace," says Peel. M&AE

HIGH-DENSITY AND/OR MIL-SPEC CONNECTORS

Connector type	Military specifications met
Advanced Circuit Technology, 118 Northeastern Blvd., Nashua, NH 03062-1919 (603) 880-6000 Circle 168	
Standard Sculptured flexible circuits; Custom Sculptured flexible circuits	Mil-P-50884C, -55110D, -81728A,-46112B, -13949G, Mil-Std-2000A, -2118, -454K, -130G, -129H, -1285A, Mil-E-5400, Mil-T-10727B, Mil-G-45204C, Mil-C-14550A, Mil-I-43553, Mil-I-16923, Mil-I-46058 (this is a partial listing of all specs met)
Alden Products, P.O. Box 510, 117 N. Main St., Brockton, MA 02403 (508) 583-0160 Circle 169	
Circular, plastic shell, autolocking and sealing	Mil-C-39029 (Also complies with Mil-Q-9858 and Mil-I-45208)
AMP, P.O. Box 3608, Harrisburg, PA 17105-3608 (800) 522-6752 Circle 170	
Circular	Mil-C-38999, -83723, -26482, -5015
Printed wiring board	Mil-C-55302, -21097
Fiber optic	Mil-C-83522
Flat cable	Mil-C-83503
Connector contacts	Mil-C-39029
Rack and panel	Mil-C-81659, -24308, -83527
RF	Mil-C-39012, -83517, -A-55339
Amphenol Aerospace, 40-60 Delaware Ave., Sidney, NY 13838 (607) 563-5011 Circle 171	
Circular Optical Two-piece cardedge LIF EMI filter EMP filter Rack and panel composite I/O	Mil-C-38999 Series I, II & III, -26500, -83723 III, -26482 I & II, Arinc 404, 600, 629, Mil-C-5015, ESC-10, -11, NAS 1599, EW2997, M39029, M85049, Mil-C-27599, -22992, -22992 Class L, -55302, -81511
Burndy Corp., 51 Richards Ave., Norwalk, CT 06856 (203) 838-4444 Circle 172	
Card connectors with filtered contacts	Mil-C-55302
D-Sub connectors with filtered contacts	Mil-C-24308
Cinch Connectors 1500 Morse Ave., Elk Grove Village, IL 60007 (708) 981-0600 Circle 173	
Edge-board cable mount	Mil-C-83513, Mil-C-55302
0.020 button	Being drafted
0.040 button	Being drafted

Connector type	Military specifications met
Connector Industries of America, A Uni-Star Industries Inc. Company, 10340 Julian Drive, Cincinnati, OH 45215 (513) 772-3680, fax (513) 772-3688 Circle 174	
Bayonet	Mil-C-83723
Bayonet & threaded	Mil-C-38999
D Sub Micromini	Mil-C-83513
Connector Technology Inc., 9 Veronica Ave., Somerset, NJ 08873 (908) 745-2880 Circle 175	
Circular Printed circuit board Hermetic	Mil-C-26482 Series I, II, -38999 I & II, M24308, M55302, Mil-D-3899 Series III
CTS Connector Products, New Hope, MN, 55428 (612) 533-3533 Circle 176	
Metal headers and backpanels	Mil-C-28754
Printed circuit, backpanels assemblies and components	Mil-C-28859
Molded, rectangular, printed circuit	Mil-C-55302
Blade and fork header/backpanel	Mil-C-28754
Daburn Electronics & Cable Corp., 224 Pagasus Ave., Northvale, NJ 07647 (201) 768-5400 Circle 177	
Banana plug	Mil-C-28901/1
Phone tip plug	Mil-C-28901/5
Delta Electronics Mfr. Corp., P.O. Box 53, 416 Cabot St., Beverly, MA 01915-0053 (508) 927-1060 Circle 178	
RF	Mil-C-39012, Mil-A-55339
BNC, N, adapters	
Detoronics Corp., 10660 E. Rush St., South El Monte, CA 91733 (818) 579-7130 Circle 179	
Circular-hermetic	Mil-C-5015, -25955, -26482, -26500, -27599, -38999, -81703, -83723, -1599
Rectangular-hermetic	Mil-C-24308
Deutsch Engineered Connecting Devices, 36033 Whittier Ave., Hemet, CA 92545 (909) 849-7822, fax (909) 922-1544 Circle 180	
Circular-metal	Mil-C-26482 Series I, Class 4, Series II, Classes A, H, L & W; Mil-C-38999, Series I, Class T&Y, Series III, Classes F, Y, W, Series 10, Classes F, N & W; Mil-C-81511, Series III Classes A, W, F & D, Series IV, Classes A, W, F & D; Mil-C-81703, Series 1 Classes E, P & H, Series II Class E, Series III Classes E, L & H; Mil-C-83723 Series III, Classes A, R, H & W

HIGH-DENSITY AND/OR MIL-SPEC CONNECTORS

Connector type	Military specifications met
Deutsch Engineered Connecting Devices, 36033 Whittier Ave., Hemet, CA 92545 (909) 765-2250, fax (909) 765-2255 Circle 180 *(continued)*	
Composites	Mil-C-29600, Series A & B; Mil-C-38999, Series III M&D, Mil-T-81714, Series II; AFLC8810310B qualification in process
Elco Corp., Huntingdon Industrial Park, Huntingdon, PA 16652 (814) 643-0700 Circle 181	
Printed circuit	M21097, M55302, M28731
Microminiature	M83513
Card edge	M21097
Rack and panel	M28731
Field telephone	M55074
G&H Technology, 750 W. Ventura Blvd., Camarillo, CA 93010 (805) 484-0543 Circle 182	
Circular	Mil-C-38999, Series III & IV; Mil-C-28840
Hoffman Engineering Corp., 911 Hope St., Box 4430, 8 Riverbend Ctr., Stamford, CT 06907-0430 (203) 425-8900 Circle 183	
Aircraft panel power	MS90335
Multipin, multivoltage power	Mil-C-55302A
Hypertronics Corp., 16 Brent Dr., Hudson, MA 01749-2978 (800) 225-9228 Circle 184	
Two-, three-row PCB	Mil-C-55302
IEH Corp., Brooklyn Army Terminal, Ste. 8E & 8F, 140 58th Street, Brooklyn, NY 11220, (718) 492-4449, fax (718) 492-9897 Circle 185	
High density PCB	Mil-C-55302 sizes; 10, 20, 30, 40, 50, 60, 70, 80, 90, 100, 122, 152, 206
High density PCB	Mil-C-55302 (REF) sizes; 58-300 in steps of 4
ITT Cannon, 1851 E. Deere Ave., Santa Ana, CA 92705-5720 (714) 261-5300 Circle 186	
Micro-D	Mil-C-83513
Rack & panel	Mil-C-81659
Rack & panel hi-rel	Mil-C-83733
Circular	Mil-C-38999, series I, II, & III; Mil-C-28840; Mil-C-26482 Series I & II; Mil-C-5015; Mil-C-5015 rear release; Mil-C-83723 Series II
Fiber optic	Mil-C-83526; Mil-T-29504
Space station	SSQ-21635, -21636, -22681, -22698
Underwater	Mil-C-22249, -24217
D-sub	Mil-C-24308

Connector type	Military specifications met
J.S.T. Corp., 1200 Business Center Dr., Ste. 400, Mt. Prospect, IL 60056 (800) 947-1110 Circle 187	
D-subminiature (SMT; JS Series)	Mil-C-24308
D-subminiature (SMT; KS Series)	Mil-C-24308
M/A-COM, 100 Chelmsford St., Lowell, MA 01853-3295 (800) 366-2266 Circle 188	
RF coaxial	Mil-C-39012
Malco Microdot, 201 Progress Dr., Montgomeryville, PA 18936 (215) 699-5373 Circle 189	
Circular	—
Headers (rectangular shape, aluminum extrusion)	Mil-C-28754
Backpanels	Mil-C-28754, -28859, Mil-A-28870
Circular hermetics	Mil-C-5015, -26482, -26500, -38999, -83723, -81703
Plastic & metal shell micro-miniature rectangular (9-100 positions)	Mil-C-83513
Metal shell microminature rectangular (40-184 positions)	Mil-C-55302
High-density microminiature rectangular (4 row: 38-400 positions)	Mil-C-83513, Mil-C-55032
Coaxial	Special micro proprietary design
Microway Systems, Inc., 7000 N. Lawndale Ave., Lincoln Wood, IL 60645-2610 (708) 679-8833 Circle 190	
Rectangular rack & panel, metal & plastic D style	Mil-C-83513, Mil-C-55302, -120, -124
Microtech, Inc., 1420 Conhester Hwy., Boothwyn, PA 19061 (610) 459-3566 Circle 191	
Miniature coaxial and multi-contact	—
Omnetics Connector Corp., 7260 Commerce Circle East, Minneapolis, MN 55432 (612) 572-0656 Circle 192	
Printed circuit board, SMT, microminiature	Mil-C-83513C

HIGH-DENSITY AND/OR MIL-SPEC CONNECTORS

Connector type	Military specifications met
Pacific Coast Technologies, 434 Olds Station Rd., Wenatchee, WA 98801 (509) 664-8000, fax (509) 664-6868 Circle 193	
Any military connector in laser weldable aluminum hermetics. Custom aluminum hermetic laser weldable connectors and microelectronic packages	Mil-C-83513 Micro Ds, Mil-C-24308 Sub Ds, Mil-C-28748, Mil-C-38999 Series I, II, & III
PCD, Inc., Two Technology Dr., Peabody, MA 01960 (508) 532-8800 Circle 194	
Relay sockets	Mil-S-12883
Junction modules	Mil-T-81714
Positronic Industries, Inc., 423 N. Campbell Ave., Springfield, MO 65801 (417) 866-2322 Circle 195	
D-subminiature	M24308, M39029
Rack and panel	M28748, M39029
Sealtron, 9705 Reading Rd., Cincinnati, OH 42515-3592 (513) 733-8400 Circle 196	
Hermetic	Mil-C-5015, -25955, -26500, -81703, -26482 Series I & II, -38999, Series I, II & III, -83723, Series I, II & III, NAS-1599, ESC 10, ESC 11
SI-TAC Connectors, Inc., 638 S. State College Blvd., Fullerton, CA 92631 (714) 449-0900, fax (714) 449-0166 Circle 197	
Mini-modular	—
77 to 303 position, Hypertac contacts	Manufactured to Mil-C-55302
17 to 160 position, Hypertac contacts	Mil-C-55302/159-164
Micro-miniature	Mil-C-83513

Connector type	Military specifications met
Spectrum Control Inc., 6000 West Ridge Rd., Erie, PA 16506 (814) 835-4000 Circle 198	
Custom EMI filtered	Mil-C-38999, -83723, -26482, -5015, -26500, -27599
Stetco, Inc., 3344 Schierhorn, Franklin Park, IL 60131 (708) 671-4208 Circle 199	
Coaxial	Mil-C-39012
Teradyne, Inc., Connection Systems Div., 44 Simon St., Nashua, NH 03060 (603) 880-9461 Circle 200	
Multilayer printed circuit processing	Mil-P-55110
Multilayer PCB, assembled and tested	Mil-A-28870
Standard NAFI components	Mil-C-28754, -28859, WS6157
Futurebus+ ultra high-density	EIA 700A (This specification has not yet been released.)
Texas Instruments, 34 Forest St., M/S 14-01, Attleboro, MA 02703 (508) 699-5375 Circle 201	
PCB	Mil-C-55302
Trompeter Electronics, 31186 La Baya Dr., Westlake Village, CA 91362 (800) 982-2629 Circle 202	
Twinax	Mil-C-39029
Coax	Mil-C-49142
Triax	Mil-C-39012

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High hopes for high-rel PLDs in the military

CPLD and FPGA manufacturers look to steal market share away from the PAL and gate array market with new offerings.

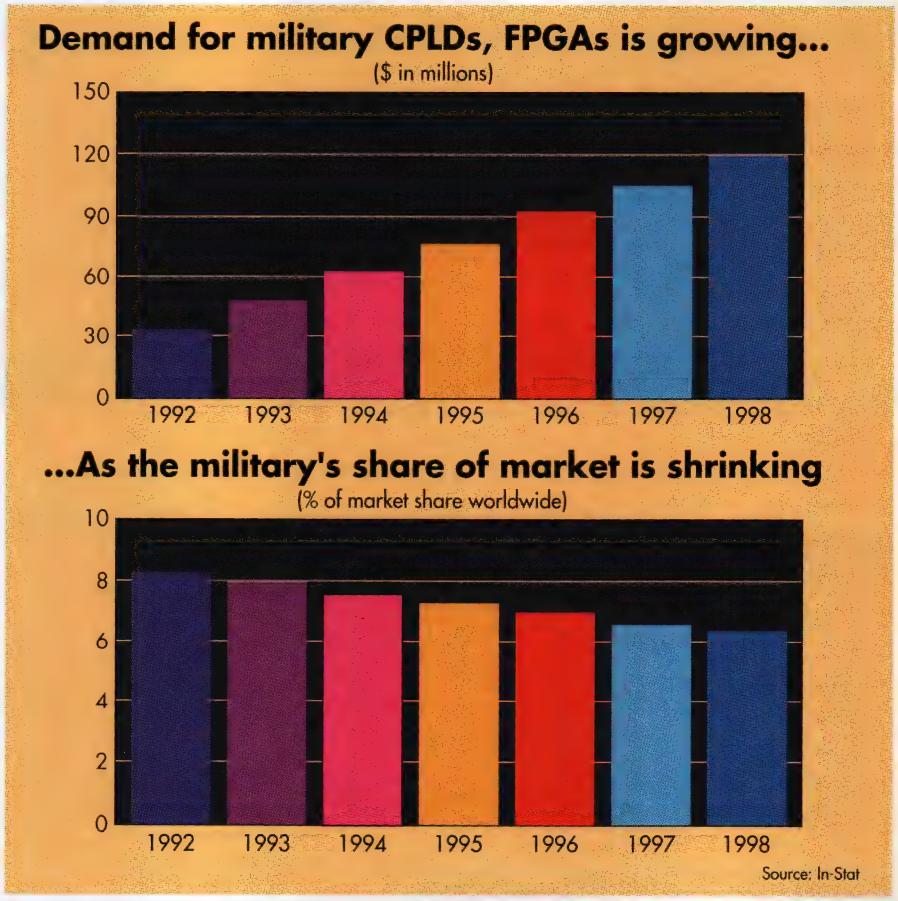
Field-programmable gate arrays (FPGAs) and complex programmable logic devices (CPLDs) are cropping up in more and more military designs these days. That's because programmable logic offers engineers greater design flexibility so they can make last-minute changes, which saves time and money in the design cycle.

While FPGAs and CPLDs make life easier for designers, the military's increased use of FPGAs and CPLDs does not represent a dramatic business opportunity for vendors. Market researcher In-Stat (Scottsdale, Ariz.) estimates the worldwide military market for high-capacity PLDs, which includes CPLDs and FPGAs, was just $48.4 million in 1993. By comparison, the total worldwide market for user-programmable logic, which includes both simple and high-capacity PLDs, was $7.9 billion in 1993 and is projected to double by 1998, according to In-Stat.

While small, In-Stat is projecting solid growth for the military CPLD and FPGA market over the next five years with worldwide military sales reaching $120.2 million by 1998. Not surprisingly, North America will continue to account for the lion's share of the worldwide military business, growing from $36.6 million in 1993 to $93.1 million by 1998, according to In-Stat.

According to Rhondalee Rohleder, president of Pace Technologies in Scottsdale, Ariz., "CPLD vendors are successful in attracting PAL users to higher-capacity products, while FPGA vendors are attracting gate array designers into the programmable arena." Gate array designers using programmable logic products for the first time tend to use FPGAs rather than CPLDs because the architectural similarities between FPGAs and gate arrays make the design process more comfortable for them, she says. This trend is expected to continue, especially as gate arrays move into higher and higher densities.

User-programmable logic manufacturers do have to work on decreasing the cost of FPGAs and increasing the performance of the devices. They are doing this with a slew of new products that offer higher densities, better performance and QML certifications.



To reprogram or not to reprogram

High-reliability military FPGA and CPLD markets are growing rapidly. And as the market grows, new technologies evolve. One debate that is raging is whether or not reprogrammability is absolutely necessary. For FPGAs there is the antifuse architecture, a one-time programmable part, and SRAM and EPROM-based parts. Whether or not a designer chooses a reprogrammable part depends on the application.

Manufacturers may argue over which part is better, but Rohleder believes there is room in the market for a variety of architectures. M&AE

CPLDs AND FPGAs FOR MILITARY APPLICATIONS

Family name/Part number	Speed grade	Military temp. range? (Yes/No)	DESC drawing #?	Mil-Std-883B? (Yes/No)	I/O pins	Maximum usable gates	Packaging
Actel, 955 E. Arques Ave., Sunnyvale, CA 94086 (408) 739-1010, fax (408) 739-1540 Circle 208							
ACT 1/A1010B	Std, -1	Yes	5962-90964	Yes	57 (max.)	1,200/3,000 (gate array equiv./PLD equiv.)	84-CPGA
ACT 1/A1020B	Std, -1	Yes	5962-93221	Yes	69(max.)	2,000/6,000	84-CPGA; 84-CQFP
ACT 2/A1240A	Std, -1	Yes	5962-93221	Yes	104 (max.)	4,000/10,000	132-CPGA
ACT 2/A1280A	Std, -1	Yes	5962-92156	Yes	140 (max.)	8,000/20,000	176-CPGA; 172-CQFP
ACT 3/A1425A	Std, -1	Yes	To be determined	Yes	100 (max.)	2,5000/6,250	133-CPGA; 132-CQFP
ACT 3/A1460A	Std, -1	Yes	Same as above	Yes	140 (max.)	6,000/15,000	207-CPGA; 196-CQFP
ACT 3/A14100A	Std, -1	Yes	Same as above	Yes	168 (max.)	10,000/25,000	257-CPGA; 256-CQFP
Altera, 2610 Orchard Pkwy, San Jose, CA 95134-2020 (408) 894-7000, fax (408) 435-1394 Circle 209							
MAX5000/EPM5130	-30/-25 ns Tpd	Yes	5962-93144	Yes	64	2,500	100-pin PGA; 100-pin CQFP
MAX5000/EPM5192	Same as above	Yes	5962-92062	Yes	64	3,750	84-pin PGA
MAX7000E/EPM7192E	-20/-15 ns Tpd	Yes	5962-93168	Yes	120	3,750	160-pin PGA
MAX7000E/EPM7256E	Same as above	Yes	5962-93247	Yes	128/160	5,000	192-pin PGA; 208-CQFP
Flex8000/EPF8820	-3	Yes	5962-94634	Yes	116	8,000	192-pin PGA; 208-pin CQFP
Flex8000/EPF81188	-3	Yes	5962-94733	Yes	180	12,000	232-pin PGA
AT&T Microeletronics, 555 Union Blvd., Allentown, PA 18103 (800) 372-2447, fax (610) 712-4106 Circle 210							
ATT 3000 Series: ATT3020, ATT3042, ATT3090	-50/-70/-100/-125	Yes	Yes: Contact AT &T for listing	No; AT&T is QML certified (JAN Equivalent)	64 to 144	2,000 to 9,000	Contact AT&T for options
Chip Express Corp., 2903 Bunker Hill Ln., Ste. 105, Santa Clara, CA 95054 (408) 988-2445, fax (408) 988-2449 Circle 211							
QYH400	Flip Flop toggle rate-350 MHz	Yes	—	No	76-224	2,000 to 18,000	All sizes and styles DIP, PGA, BGA, PLCC, PQFP, TQFP
QYH500	Flip Flop toggle rate-600 MHz	Yes	—	No	140-400	10,000 to 80,000	All sizes and styles DIP, PGA, BGA, PLCC, PQFP, TQFP
Cypress Semiconductor, 3901 N. First St., San Jose, CA 95134-1599 (408) 943-2600, fax (408) 942-2741 Circle 212							
MAX5000/CY7C341	15 to 40 ns	Yes	5962-92062	Yes	72	192 macrocells	84-lead PLCC, HLCC, CPGA
MAX5000/CY7C342	15 to 35 ns	Yes	5962-89468	Yes	60	128	68-lead PLCC, HLCC, CPGA
MAX5000/CY7C343	20 to 35 ns	Yes	5962-92158	Yes	36	64	44-lead PLCC, HLCC
MAX5000/CY7C344	15 to 35 ns	Yes	5962-90611	Yes	24	32	28-pin PLCC, HLCC, plastic DIP, CDIP
MAX5000/CY7C346	15 to 35 ns	Yes	—	Yes	68	128	84-pin HLCC, PLCC, 100-pin PGA, CQFP

CPLDs AND FPGAs FOR MILITARY APPLICATIONS

Family name/Part number	Speed grade	Military temp. range? (Yes/No)	DESC drawing #?	Mil-Std-883B? (Yes/No)	I/O pins	Maximum usable gates	Packaging
Cypress Semiconductor, 3901 N. First St., San Jose, CA 95134-1599 (408) 943-2600, fax (408) 942-2741 Circle 212 *(continued)*							
Flash370/CY7C371	66 to 143 MHz	Yes	—	Yes	32	32	44-pin PLCC, HLCC
Flash370/CY7C372	66 to 100 MHz	Yes	—	Yes	32	64	44-pin PLCC, HLCC
Flash370/CY7C373	66 to 100 MHz	Yes	—	Yes	64	64	84-pin PLCC, HLCC, CPGA
Flash370/CY7C374	66 to 100 MHz	Yes	—	Yes	64	128	84-pin PLCC, HLCC, CPGA
Flash370/CY7C375	66 to 100 MHz	Yes	—	Yes	128	128	160-pin TQFP, CPGA
pASIC380/CY7C381A	-0,-1, -2	Yes	—	Yes	32	1,000/3,000 (EPLD/LCA gates)	44-pin PLCC
pASIC380/CY7C382A	Same as above	Yes	—	Yes	56	1,000/3,000	68-pin PLCC, CPGA, 100-pin TQFP
pASIC380/CY7C383A	Same as above	Yes	—	Yes	56	2,000/6,000	68-pin PLCC, CPGA
pASIC380/CY7C384A	Same as above	Yes	—	Yes	68	2,000/6,000	84-pin PLCC, CPGA, 100-pinTQFP
pASIC380/CY7C385A	Same as above	Yes	—	Yes	68	4,000/12,000	84-pin PLCC, CPGA, 100-pin TQFP
pASIC380/CY7C386A	Same as above	Yes	—	Yes	114	4,000/12,000	144-pin TQFP, CPGA
Harris Semiconductor, 2401 Palm Bay Rd., P.O. Box 883, Melbourne, FL 32902 (800) 4-Harris, fax (407) 724-7257 Circle 213							
HS9-3090-50RH	50 MHz	Yes	No	S&B equivalent (qual. avail)	144	9,000	164-pin CQFP
HS9-3020-50RH	50 MHz	Yes	No	Same as above	64	2,000	100-pin CQFP
Lattice Semiconductor Corp., 5555 NE Moore Ct., Hillsboro, OR 97124 (503) 681-0118, fax (503) 681-3037 Circle 214							
ispLSI 1032-60LG/883	60 MHz	Yes	5962-9308501 MXC	Yes	64	6,000	84-pin CPGA
ispLSI 1024-60LH/883	60 MHz	Yes	5962-9476101 MXC (Preliminary)	Yes	48	4,000	68-pin JLCC
ispLSI 1016-60LH/883	60 MHz	Yes	5962-9476201 MXC (Preliminary)	Yes	32	2,000	44-pin JLCC
pLSI 1032-60LG/883	60 MHz	Yes	5962-9466801 MXC	Yes	64	6,000	84-pin CPGA
pLSI 1024-60LG/883	60 MHz	Yes	5962-9476001 MXC (Preliminary)	Yes	48	4,000	68-pin JLCC
pLSI 1016-60LG/883	60 MHz	Yes	5962-9476301 MXC (Preliminary)	Yes	32	2,000	44-pin JLCC
QuickLogic Corp., 2933 Bunker Hill Lane, Santa Clara, CA 95054 (800) 842-FPGA, fax (408) 987-2012 Circle 215							
Wildcat pASIC 1: QL8x12B	9.2 nS pin-to-pin (worst case mil temp)	Yes	—	Rev D in Q3/95	64	1,000	PLCC-44, -68, TQFP-100, CPGA-68, CQFJ-68
Wildcat pASIC 1: QL12x16B	9.2 nS pin-to-pin (worst case mil temp)	Yes	—	Rev D in Q2/95	88	2,000	PLCC-68, -84, TQFP-100, CPGA-84, CQFJ-100
Wildcat pASIC 1: QL16x24B	9.2 nS pin-to-pin (worst case mil temp)	Yes	—	Rev D in Q2/95	122	4,000	PLCC-84, TQFP-100, 144,CPGA-144, CQFJ-100, -160

CPLDs AND FPGAs FOR MILITARY APPLICATIONS

Family name/Part number	Speed grade	Military temp. range? (Yes/No)	DESC drawing #?	Mil-Std-883B? (Yes/No)	I/O pins	Maximum usable gates	Packaging
QuickLogic Corp., 2933 Bunker Hill Lane, Santa Clara, CA 95054 (800) 842-FPGA, fax (408) 987-2012 Circle 215 *(continued)*							
Wildcat pASIC 1: QL24x32B	9.2 nS pin-to-pin (worst case mil temp)	Q2/95	—	Rev D in Q4/95	172	8,000	PQFP-208, TQFP-144, CPGA-223, CQFP-208
Texas Instruments, 1-20 & FM 1788, Midland, TX 79711 (915) 561-6924, fax (915) 561-6716 Circle 216							
TPC1240M, 1.2-µm	Standard	Yes	—	Yes	104	3,200	133-pin CPGA
TPC1280M, 1.2-µm	Standard, -1	Yes	5962-9215601MXA, YA: 5962-9215602 XA, YA	Yes	140	7,200	176-pin CPGA; 177-pin CPGA; 172-pin CPGA
TPC1010AM, 1.2-µm	Standard	Yes	5962-9096401 MXA, YA	Yes	57	1,080	84-pin CPGA & CQFP
TPC1020AM, 1.2-µm	Standard, -1	Yes	5962-9096501 MUA, TA: 5962-9096502MUA, TA	Yes	69	1,800	Same as above
TPC1020BM, 1.2-µm	Standard, -1, -2	Yes	Planned	Yes	69	1,800	Same as above
TPC1280AM, 1.2-µm	Standard, -1, -2	Yes	Planned	Yes	140	7,200	176-pin CPGA; 172-PIN CQFP
Xilinx, Inc., 2100 Logic Dr., San Jose, CA 95124-3450 (408) 559-7778, fax (408) 879-4676 Circle 217							
XC2000 Family/FPGA	- 33, - 50, -70 , -100	Yes	5962-88638 (XC2018)	Yes	58/74	800 to 1,200 (typ.)	CPGA, PLCC, TQFP, VQFP
XC3000 Family/FPGA	-50, - 70, -100	Yes	5962-89948 (XC3020); 5962-89713 (XC3042); 5962-89823 (XC3090)	Yes	64/96/144	1,200 to 5,000	CPGA, CQFP with Non-conductive tie-bar, CQFP, PLCC, PQFP, TQFP, VQFP, PGA
XC3000A Family/FPGA	-7	Yes	—	No	64/96/144	1,200 to 5,000	CPGA, CQFP with Non-conductive tie-bar, PLCC, PQFP, TQFP, VQFP, PGA
XC3100 Family/FPGA	-5	Yes	—	No	64/96/144/ 176	1,200 to 7,500	Same as above
XC3100A Family/FPGA	-5 , -3	Yes	Under development	Yes	64/96/144/ 176	1,200 to 7,500	Same as above
XC4000 Family/FPGA	-10, -6, -5	Yes	5962-94712 (XC4003A); 5962-92252 (XC4005); 5962-92305 (XC4010); 5962-94730 (XC4013)	Yes	80/112/160 /192/256	3,000 to 25,000 (40,000 with RAM)	CPGA, CQFP with Non-conductive tie-bar, PLCC, PQFP, TQFP, VQFP, PGA, BGA
XC7200 Family/EPLD	-25, -20	Yes	Under development	Avail. in 1995	36/72	36/72 macrocells	CPGA, Ceramic windowed-LCC, PLCC
XC7300 Family/EPLD	-20, -15, -12	Yes	Under development	Avail. in 1995	54/108	54/108 macro-cells	CPGA, Ceramic windowed-LCC, PLCC, PGFP, BGA

Infrared sensors: the eyes of the digital battlefield

Infrared focal plane arrays are becoming cheaper as manufacturers cut costs.

Manufacturers of infrared focal plane arrays (IRFPAs), an IC hybrid with an IR sensor on top of a CMOS IC, are working to cut manufacturing costs to generate more demand for the technology from military and commercial customers. Currently, IRFPAs provide the eyes of thermal imaging systems used for night vision, gunners' sites, smart bombs, surveillance, and nondestructive testing and inspection.

The military market for IRFPAs was estimated at $500 to $525 million for 1993, and it is predicted to grow 30 percent to $650 million by 1997, says Ken Herbert at Frost & Sullivan, Inc. (Mountain View, Calif.). Herbert estimates the commercial market for IRFPAs was less than $100 million in 1993 but is expected to grow to about $150 million by 1997.

Programs targeting lowering manufacturing costs are underway. The Advanced Research Projects Agency (ARPA) is now in the second stage of a four-year-old producibility program aimed at decreasing IRFPA manufacturing costs, and the Manufacturing Technology Directorate at Wright-Paterson AFB is conducting its own parallel program.

To lower costs, manufacturers are experimenting with different materials for IRFPA substrates that will enable them to produce uncooled IRFPAs as well as cheaper cooled IRFPAs. Today the majority of IRFPAs need to be cooled to 77° Kelvin, but by eliminating the cryogenic cooler and manufacturing the IRFPAs to operate at ambient temperatures, the cost for IR systems will decrease significantly. This technology is still young and offers trade-offs in performance.

Besides R&D in uncooled technology, manufacturers are also investigating imaging simultaneously in two bands as well as putting the signal processing function on the IRFPA itself.

HgCdTe manufacturability

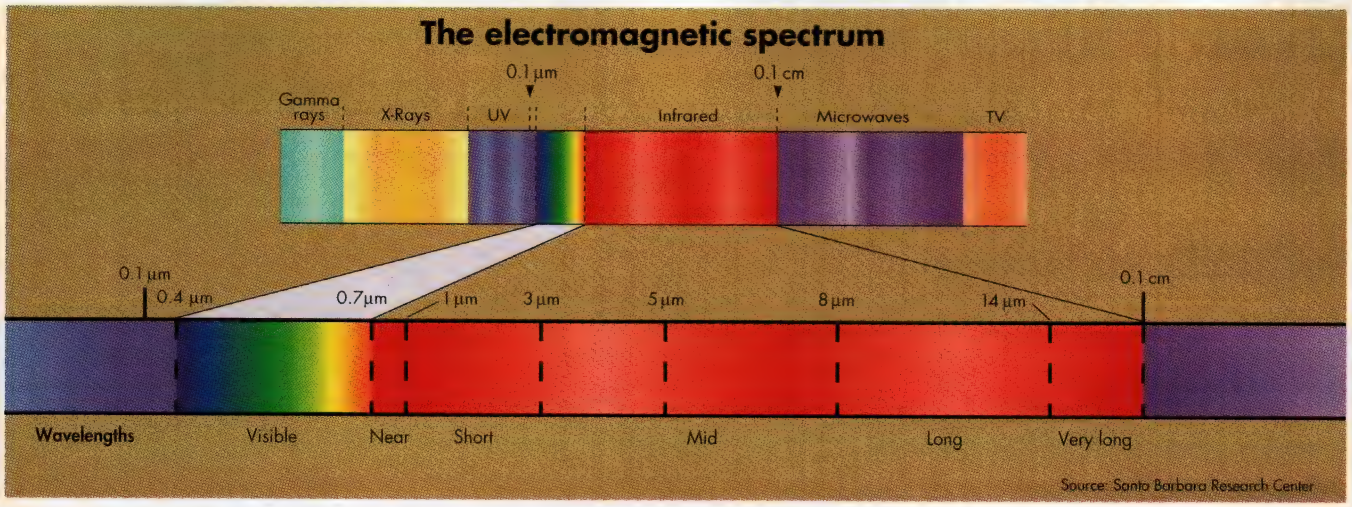
The goal of ARPA's IRFPA Program is to bring down the costs of manufacturing Mercury Cadmium Telluride (HgCdTe) arrays. In 1990, Rockwell (Anaheim, Calif.) and Santa Barbara Research Center (SBRC; Goleta, Calif.) worked on reducing costs of HgCdTe. In October 1992, ARPA awarded $20 million contracts to SBRC and Loral IR & Imaging Systems (LIRIS; Lexington, Mass.).

The IRFPA program's goals from 1990 to 1995 are to reduce manufacturing costs by a factor of 100, says Ray Balcerak, IRFPA program manager. Under this contract LIRIS and SBRC will each build two scanning arrays and two staring arrays.

SBRC is building the largest longwave infrared (LWIR), two-dimensional staring array (480 × 640). SBRC's leapfrog technology promises to revolutionize the current forward-looking IR (FLIR) industry, says SBRC's Ken Ando, manager of marketing operations.

Moving toward uncooled

Uncooled IRFPAs promise to lower the technology's price tag but no one is holding their breath for off-the-shelf availability. Uncooled technology does, however, have drawbacks. It does not have the long range targeting ability that cooled devices offer. It also offers less sensitivity to IR radiation. For highest sensitivity, cooled HgCdTe IRFPAs will be the answer for several years. Uncooled technology will not replace cooled technology because of the differences in sensitivity. M&AE



INFRARED SENSORS FOR FOCAL PLANE ARRAYS

Array type	Wavelength	Staring configurations	Scanning configurations
Amber, A Raytheon Co., 5756 Thornwood Dr., Goleta, CA 93111 (805) 683-6621, fax (805) 683-4824 Circle 222			
InSb	3 to 5 μm	128 x 128; 256 x 256; (two types); 512 x 512, 484 x 512 (3 to 4 aspect)	240 x 4
Si:Ga	3 to 5 μm	128 x 128	—
HgCdTe	3 to 5 μm	128 x 128	240 x 4; 480x 4
Loral Fairchild Systems, 300 Robbins Ln., Syosset, NY 11791 (516) 349-2421, fax (516) 349-2639 Circle 223			
Airborne Mini-FLIR, TtSi	3 to 5 μm	512 x 512	—
Navigation FLIR, PtSi	3 to 5 μm	480 x 640	—
Missile Sensor, PtSi	3 to 5 μm	256 x 256; 256 x 400	—
Loral Infrared and Imaging Systems, Two Forbes Rd., Lexington, MA 02173-7393 (617) 863-3057, fax (617) 863-3496 Circle 224			
Rad Hard I, HgCdTe	8 to 12 μm	128 x 128	—
Rad Hard II, HgCdTe	8 to 12 μm	256 x 256	—
Advanced FPA I, HgCdTe	8 to 12 μm	480 x 640	—
Multi-Mission Seeker, HgCdTe	8 to 12 μm	128 x 128	—
Advanced FPA II, HgCdTe	3 to 5 μm	—	480 x 4
Uncooled I Si	8 to 12 μm	326x 256	—
Uncooled II Si	8 to 12 μm	480 x 640	—
SADA II/HTI, HgCdTe	8 to 12 μm	—	480 x 4
SADA I/Comanche, SADA II/HTI, HgCdTe	8 to 12 μm	—	480 x 4
Javelin Seeker, HgCdTe	8 to 12 μm	64 x 64	—
Rockwell International Corp., Electro-Optical Center, 3370 Miraloma Ave., Anaheim, CA 92803, fax (714) 762-1493 Circle 225			
HgCdTe	1 to 3 μm; 3 to 5 μm; 5 to 8 μm	256 x 256, 1,024 x 1,024 (1 to 3μm); 64 x 64, 128 x 128, 256 x 256, 320 x 240, 640 x 480 (3 to 5 μm); 64 x 64 (5 to 8 μm); 128 x 128 (8 to 12 μm)	3 x 512, 8 x 256 (1 to 3 μm); 8 x 256 (3 to 5 μm)
Si IBC	12 to 40 μm	128 x 128 (12 to 40 μm)	12 x 192, 20 x 64 (12 to 40 μm)
Santa Barbara Research Center, 75 Coromar Dr., Goleta, CA 93117 (805) 562-2839, fax (805) 562-4100 Circle 226			
PtSi	3 to 5 μm	128 x 128; 256 x 256; 512 x 512; 480x 640	—
InSb VISMIR	1 to 5 μm	64 x 64; 128 x 128; 256 x 256; 480 x 640; 1,024 x 1,024	480 x 4
InSb	3 to 5 μm	64 x 64; 128 x 128; 256 x 256; 480 x 640; 1,024 x 1,024	480 x 4
Te-cooled HgCdTe	3 to 5 μm	320 x 240; 128 x 128; 256 x 256	—
HgCdTe	8 to 12 μm; 14 ro 16 μm; 16 to 20 μm	64 x 64 ; 128 x 128; 256 x 256; 480 x 640	240 x 1; 240 x 2; 240 x 4; 480 x 4 480 x5
Incooled FPA (Si/VOx)	8 to 12 μm	320 x 240	—
Texas Instruments, Defense Systems & Electronics Group, 8505 Forest Ln., Dallas, TX 75243 (214) 995-1089, fax (214) 995-6778 Circle 227			
HgCdTe	1 to 2.5 μm; 3 to 5 μm; 8 to 12 μm	64 x 64; 256 x 256 (3 to 5 μm); 64 x 64, 128 x 128, 256 x 256 (8 to 12 μm)	240 x 1 (3 to 5 μm); 128 x 28 (CCD; 3 to 5 μm); 240 x 1, 240 x 2; 240 x 4; 480 x 4; 480 x 5 (8 to 12 μm)

ELDEC has the answers.

Commercial Components

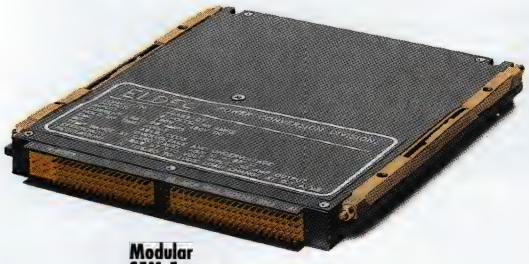
One thing is clear: The rules are changing. The new procurement environment will reward only those companies that cut costs and improve reliability.

We've done our homework. For the last six years, ELDEC has investigated and established reliable methods to incorporate commercial components in aerospace products. Working with military and aerospace customers, we have already fielded products using these components in high reliability applications. Our methods are effective: costs are down some 30%, while reliability figures exceed military requirements.

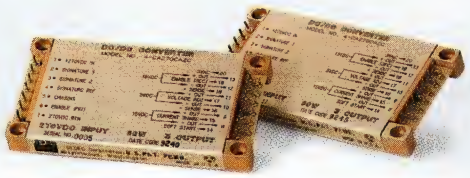
Not all commercial components can be used in every application. Equipment manufacturers must have in place an established process to select, qualify, and apply components in the intended environment, and a system to guarantee consistent reliability. For example, in designing our present line of modular power supplies, ELDEC has tested thousands of components, representing billions of operating hours.

Modular Power

We're ready to go now! Modular SEM-E power supplies, DC-DC converters, filters, holdup and other building blocks are available today, in commercial or military technology. You choose. Call us today and we'll work with you to cut costs and win new business.



Modular SEM-E power supply family



Modular DC-DC converter building blocks

For more information, contact: ELDEC Corporation
Power Conversion Division, Marketing and Sales
P.O. Box 100 M/S M3-20, Lynnwood, Washington, 98046-0100
Phone: (206) 743-8399 Fax: (206) 743-8562

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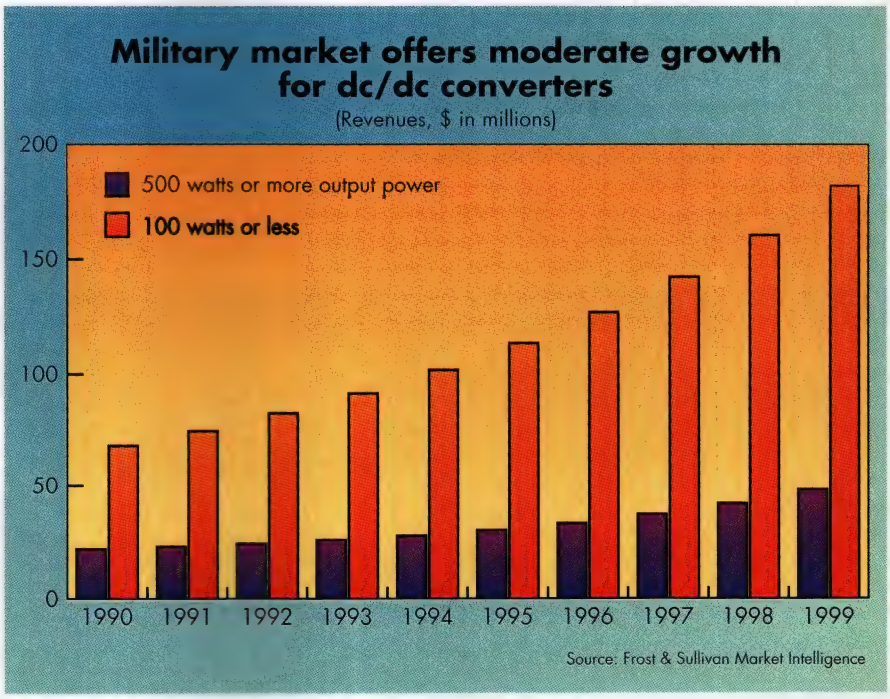
In search of new power strategies

Military dc/dc converter makers are looking for ways to differentiate themselves from the competition.



Over 300 companies claim to manufacture dc/dc converters that meet military specifications, and no two products are the same. What does a designer consider in deciding which converter to use? At the top of the list is the price-performance tradeoff. The pressure is on for manufacturers to increase their density and efficiency while decreasing noise and size.

In this competitive environment, the dc/dc converter has moved from a low-tech, component-like device to a high-tech subassembly that has forced engineers to carefully consider early in the design cycle what power inputs/outputs are needed. Indeed, 10 years ago, dc/dc power supplies were looked at as just another component.

Keeping up with demand

Because power supplies are now considered a building block for any computer system, manufacturers are vying to keep up with customer demands.

To help reduce costs, higher power dc/dc converter modules are used. The trend to modules is being driven by the fact that some systems have total power requirements of as high as 2,000 Watts. Using 200-Watt dc/dc converters to meet such a power need is cumbersome, therefore, a power source greater than 200 Watts is needed to reduce the number of modules in a system.

Of course, cost is not the only factor. Reliability must also be considered. Military system manufacturers are beginning to recognize that the evolution of system architectures warrants a look at other issues in the dc/dc converter selection process. EMI emissions are an increasingly important concern, particularly as systems move to higher speeds. Also, reliability must be considered in a new light as systems grow in size and complexity and integrate increasingly large numbers of converters. And efficiency and thermal management take on a new dimension as system voltages drop under the 5 V level.

Using modular devices is part of the distributed power or point-of-use power strategy—that is, putting power supplies where needed. The trend in most systems is a move toward distributed power. Using distributed power allows power processing to be added later, when needed.

Market shakeup

While the military is the largest market for dc/dc converters, it has the lowest growth for dc/dc shipments, sources say. Analysts predict that by 1996, the biggest market for dc/dc power supplies will be the computers and communications market.

Frost & Sullivan Market Intelligence (Mountain View, Calif.) predicts that applications in the military and aerospace markets for devices of 100 W or less will provide healthy revenues. The market for these low-end devices is predicted to hit $1.8 billion by 1999. Applications for dc/dc converters that have above 500 W of output power are expected to increase mostly in computer-based ground support, early warning, and missile defense systems, Frost & Sullivan predicts. By 1999, the market is expected to be $48 million.

Although Frost & Sullivan is predicting moderate market growth, some dc/dc manufacturers are not as optimistic about the defense market. Most see the market as flat, and there have been some company shake-ups with more expected. M&AE

DC/DC CONVERTERS

Product name	Military specifications	Total output power	Number of outputs	Input voltage range	Temperature range (°C)	Efficiency (%)	Line/load regulation (%)	Price
Abbott Electronics Inc., 2727 S. La Cienega Blvd., Los Angeles, CA 90034 (310) 202-8820, fax (310) 836-1027 Circle 233								
SM Series	Mil-Std-810C,-461C, 1275A, -704A	Up to 280 W	Singles, duals	14 to 40 Vdc, 200 to 400 Vdc	-55° to +100°	Up to 85	0.1	$300 to $650
AB Series	Mil-Std-810C, -461C, -1275A, -2000	Up to 200 W	Singles, duals	14 to 32 Vdc, 160 Vdc	-55° to +100°	Up to 80	0.1	$700 to $1,400
AM Series	Mil-Std-810C, -461C, -2000, -704D	Up to 100 W	Singles, triples	100 to 300 Vdc	-55° to +100°	Up to 80	0.1	$1,400
Advanced Analog, 2270 Martin Ave., Santa Clara, CA 95050 (409) 988-4930 Circle 234								
AFW2805S/CH	—	40	1	16 to 50, 80 (100 ms)	-55° to +125°	77	25 mV/150 mV	$1,495
AL02805S/CH	—	40	1	16 to 50, 80 V (100 ms)	-55° to +125°	75	10 mV/10 mV	$1,495
AL02808S/CH	—	50	1	16 to 50, 80 V	-55° to +125°	77	10 mV/10 mV	$1,495
AFL27005S	—	50	1	160 to 400 Vdc	-55° to +125°	78	5 mV/15 mV	$1,495
Analog Modules, Inc., 126 Baywood Ave., Longwood, FL 32750-3426 (407) 339-4355, fax (407) 834-3806 Circle 235								
521	M version	210 mW	1	+12 to +15 Vdc or +24 to +28 Vdc	0° to +70° or -55° to +85°	Greater than 70	0.3	$135 to $167
522	—	200 to 350 mW	1	+5 Vdc	0° to +70°	Greater than 70	0.01/0.005	$198 to $250
531	—	180 mW	1	+12 to +15 Vdc, +24 to 28 Vdc	0° to +70°	Greater than 70	0.3	$225
562	—	6 W	1	10T. 18 Vdc or 18 to 32 Vdc	-20° to 70°	Greater than 80	0.03 /0.04	$210
568	Mil-Std-704D	150 W	1	18 to 32 Vdc	-55° to 85°	Greater than 85	0.3/0.1	$698
5700	—	1.25 kW	1	280 to 340 Vdc	0° to 50°	Greater than 94	0.1	$980
Arnold Magnetics Corp., 4000 Via Pescador, Camarillo, CA 93012 (805) 484-4221, fax (805) 484-4133 Circle 236								
EL Series	Mil-Std-810, -461, etc.	Up to 600 W	1 to 8	24, 28, 48, 125, 155, 270 Vdc	-55° to +100°	80 to 90	0.1	$500 & up
ATC Power Systems, Inc., 45 Depot St., Merrimack, NH 03054 (603) 429-0391, fax (603) 429-0795 Circle 237								
PowerstepV2/-V2	—	175 to 350	Single, dual	24 to 270 Vdc	-55° to +100°	83	0.5	$1,000
PowerStep 28-270	—	100 to 150	Single	Varies 18 to 500 Vdc	-55° to +100°	83/85	±0.5	$613
PowerStep 155/270	—	100	2	100 to 500 Vdc	-55° to +100°	70	±0.5	$894
Powercard 75/360	—	75/60	1/3	19 to 40 Vdc	-55° to +100°		±1/±.05	$823/$1,325
CVS200-155/270	—	200	4 to 5	100 to 200 Vdc/200 to 400 Vdc	-55° to +100°		±0.5	$1,615
Avionic Instruments, Inc., 1414 Randolph Ave., Avenel, NJ 07001 (908) 388-3500, fax (908) 382-4996 Circle 238								
XLD100	Mil-Std-810E, -461A, FAA DO-160C	100	1	18 to 40	-55° to +71°	82	0.15	$200
XLDR300	Same as above	300	3	18 to 40	-55° to +71°	80	0.15	$800
LDP50-5/LDV50-5	—	50 Va	Single	20 to 40 Vdc	-55° to +71°	78	2	—
LDP/LDV70-12	—	70 Va	Single	20 to 40 Vdc	-55° to +71°	78	2	—
LDP/LDV100-28	—	100 Va	Single	20 to 40 Vdc	-55° to +71°	78	2	—

Inputs: 28, 155 & 270 VDC per MIL-STD-704 (A–E), MIL-STD-1275, MIL-STD-1399, and MIL-STD-461.

Outputs: 2-95 VDC at 10-100W, expandable to kilowatts.

Environments: MIL-STD-202, MIL-STD-810, MIL-STD-2036.

Quality/Reliability: MIL-I-45208, NAVMAT P-4855-1A, MIL-HDBK-217.

Meet military requirements with flying colors! When it comes to power supplies, over 1000 standard Vicor power components and configurable products fit the bill for military programs seeking the benefits of nondevelopment items (NDI) and commercial off-the-shelf (COTS) equipment.

Shop our line of military power products and find just what you need. Our building-block approach to power supply design cuts time and expense while allowing you to implement virtually any power system solution. Call Vicor today for details.

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VICOR

CIRCLE 10 ON READER SERVICE CARD

DC/DC CONVERTERS

Product name	Military specifications	Total output power	Number of outputs	Input voltage range	Temperature range (°C)	Efficiency (%)	Line/load regulation (%)	Price
Computer Products/Power Conversion, Inc., 7 Ekins St., South Boston, MA 02127-1682 (617) 464-6600, (617) 464-6612 Circle 239								
NFC	—	10 to 100 W	1 to 3	9 to 18 V, 18 to 36 V, 36 to 75 V	-40° to +60°	79 to 87	0.1	Starts at $27 (OEM Qty.)
PM600	—	1 W	1 to 2	5 V, 12 V	-40° to +70°	50	±0.3/±0.4	Under $15 (OEM Qty.)
PM900	—	5 to 6 W	1 to 2	5, 12, 24 or 48 V	-40° to +70°	60	±0.02/±0.04	$50 (OEM Qty.)
BXA3 Series	—	3 W	Single, dual	0 -18 V; 18 - 36 V; & 36 - 75 V	-25° to +71°	78 (typ.)	±2.5	—
BXA200 Series	—	200 W	1	36 V to75 V	-40° to +85°	87 (typ.)	±0.1	$100 - $200
BXA100 Series	—	100W	1	36 V to 75 V	-40° to 95°	87 (typ.)	±0.1	—
BXA75 Series	—	75W	1	36 V to 75 V	-40° to 95°	87 (typ.)	±0.1	—
NFC40 Series	—	40	single/triple	18 to 36; 36 to 72	-40° to 105°	83 (typ.)	1	$60 - $100
BXA30 Series	—	40	1	9 to 18 V; 18 to 36 V & 36 to 75 V	100° max	84 (typ.)	1/0.2	—
BXA10 Series	—	10	single/dual	9 to 18 V; 36 to 75 V	110° max case	87 (typ.)	1/0.2	—
Basix	—	200	1	36 to 75 V; 200 to 400 V	-40° to +85°	87	1%	$100-$200
NFC75 Series	—	75	1	18 to 36; 36 to 75	-40° to +95° Baseplate	87	±0.1%	$100-$500
NFC100 Series	—	100	1	36 to 75	-40° to +85° Baseplate	86	±0.1%	$100-$150
Conversion Devices, Inc., 15 Jonathan Dr., Brockton, MA 02401-5566 (508) 559-0880, fax (508) 559-9288 Circle 240								
Power-Pak Performance Series	—	165 W to 300 W	Single, dual, triple	36 Vdc to 72 Vdc or 180 Vdc to 400 Vdc	-20° to +100°	To 86	Line ±0.02%; Load ±0.1%	—
Power-Pak Standard Series	—	165 W to 240 W	1, 2 or 3	36 Vdc to 72 Vdc or 180 Vdc to 400 Vdc	-20° to +85°	To 82	Line ±0.1%; Load ±0.3%	—
Datel, Inc., 11 Cabot Blvd., Mansfield, MA 02048 (508) 339-3000, ext. 199, (508) 339-6356 Circle 241								
XHR	Mil-Std-202, -883, -461C	Up to 30 W		4.5 to 13, 9 to 36, 38 to 72	-40° to +105°	80	—	Call
UWRSeries	—	3 to 40		4.6 to 72 V	-25° to +105°	To 82	± 0.2%/± 0.5%	$47
BWRSeries	—	3 to 20		4.6 to 72 V	-25° to +105°	To 83	± 0.2%/± 0.5%	$47
TWR	—	3 to 20		4.6 to 72 V	-25° to +105°	To 82	± 0.2%/± 0.5%	$69
EG&G Power Systems, Inc., 1330 E. Cypress St., Covina, CA 91724-2198 (818) 967-9521, fax (818) 967-3151 Circle 242								
HDPC-2	Mil-Std-810, -704D, -883, -S-19500, etc.	125 W	1, 2 or 3	28 & 270 per Mil-Std-704D	-55° to +85°	80	0.5	$2,100 Qty 100
LC810	Mil-Std-810	200 W	1, 2 or 3	28 & 270 per Mil-Std-704D	-40° to +85°	80	0.5	$700 Qty 100

DC/DC CONVERTERS

Product name	Military specifications	Total output power	Number of outputs	Input voltage range	Temperature range (°C)	Efficiency (%)	Line/load regulation (%)	Price
Eldec Corp., 16700-13th Ave. W, P.O. Box 100, Lynnwood, WA 98046-0100 (206) 743-1313 Circle 243								
4-CA028	—	80 to 125 W	1, 2 or 3	15 to 50 Vdc	-55° to +125°	80 to 86	1/1	—
4-CA160	—	80 to 125 W	1, 2 or 3	80 to 250 Vdc	-55° to +125°	80 to 86	1/1	—
4-CA270	—	80 to 125 W	1, 2 or 3	125 to 475 Vdc	-55° to +125°	80 to 86	1/1	—
4-Cg (SEM-E)	—	160 to 250 W	1 to 6	Any of above	-55° to +125°	80 to 86	1/1	—
Engineered Magnetics, Inc., 18435 Susana Rd., Rancho Dominguez, CA 90221 (310) 635-9555, fax (310) 631-0313 Circle 244								
EMSE377	Multiple	40 W	1	28 Vdc	-40° to +75°	85	1	—
EMBC162	Multiple	3 W	1	40 to 125 Vdc	-10° to +61°	92	1	—
EMCR515	Multiple	230 W	1	25 to 40 Vdc	-40° to +85°	82	2	—
Farnell Advance Power, 1111 Chester Ave., Cleveland, OH 44114 (216) 349-0755, fax (216) 349-0142 Circle 245								
Q200	—	200 W	1	48 to 300 V	-20° to +85°	82	2	—
HDL Research Lab, Inc., 406 West Horton Street, P.O. Box 2108, Brenham, TX 77834-2108 (409) 836-2300 , fax (409) 836-1056 Circle 246								
45	—	750	1	22 to 34	-55° to +85°	80	1	$4,000
18	—	70	10	18 to 30	-55° to +85°	70	0.4	$4,000
32	—	100	5	18 to 30	-55° to +85°	70	2	$2,000
DC 2 Series	810, 461, 2000, 704	Up to 750 W	5	18 to 32 Vdc	-55° to 100°	Up to 90	0.1	Call
28	—	40			-55° to +85°	60	2	$900
IMO VARO ESD, 2800 W. Kingsley Rd., Garland, TX 75046 (214) 840-5531 Circle 247								
Varo 270/200 5S P.S.	—	—	1	270 Vdc	-54° to +85°	80	3 max.	—
Varo 270/200 515T P.S.	—	—	3	270 Vdc	-54° to +85°	80	3 max.	—
Varo/4APSP	—	—	4	270 Vdc	-54° to +85°	80	3 max.	—
Varo/4APSP	—	250	4	165 Vol-440 Vdc, 270 V Nom	-54° to +85°	80	± 1	—
Interpoint Corp., 10301 Willows Rd., Redmond, WA 98052 (206) 882-3100 Circle 248								
MFL	Mil-Std-883	65	1 or 2	16 to 40	-55° to +125°	87	20	$1,192
MHF+	QML	15	1 or 2	16 to 40	-55° to +125°	84	50	$500
MTR	Mil-Std-883	30	1 or 2	16 to 40	-55° to +125°	84	30	$609
MK200	—	200	1 or 2	16 to 40	-55° to +125°	90	10.4/.2	From $590
MFLHP	—	100	1 or 2	19 to 40	-55° to +85°	86	5 mV	From $717
Lambda Advanced Analog, 2270 Martin Ave., Santa Clara, CA 95050 (408) 988-4930, fax (408) 988-2702 Circle 249								
AFL270XXS/D	Mil-Std-1772, -883, Mil-H-38534	50 to 120 W	1,2	160 to 400V	-55° to +125°	85	5 mV	$720 (100s)
AFL28XXS/D	Same as above	50 to 120 W	1,2	16 to 40V	-55° to +125°	85	5 mV	$720 (100s)
ATR28XXS/D/T	Same as above	30 W	1,2, or 3	16 to 40V	-55° to +125°	84	60 mV/120 mV	$495 (100s)

DC/DC CONVERTERS

Product name	Military specifications	Total output power	Number of outputs	Input voltage range	Temperature range (°C)	Efficiency (%)	Line/load regulation (%)	Price
Logitek, Inc., 101 Christopher St., Ronkonkoma, NY 11779 (516) 467-4200, fax (516) 467-4090 Circle 250								
PSX 25	Mil-Std-461, -704, -810, -454, -1275	25 W	1	100 to 300 Vdc, 10 to 48 V	-55° to +100°	75 (min.)	0.1	$850 (min. Qty)
PSX 50	Same as above	50 W	1, 2	Same as above	-55° to +100°	75 (min.)	0.1	Same as above
PSX 75	Same as above	75 W	2 to 4	Same as above	-55° to +100°	75 (min.)	0.1	Same as above
Loral Federal Systems—Owego, 1801 State Route 17C, Owego, NY 13827 (607) 751-2000, fax (607) 751-6997 Circle 251								
28Q/05-1	Mil-Std-704C, Mil-Std-461, NAVSEA	425 W	4	28 Vdc	-40° to +70°	Greater than 70	1/1	Call
5Q-85-1	NAVMAT P4855-1A	185 W		5 Vdc	-40° to +85°	Greater than 85	3/3	Call
Maxim Integrated Products, 120 San Gabriel Dr., Sunnyvale, CA 94086 (408) 737-7600 Circle 252								
MAX717-21	—	2.65 W	3	0.9 to 5.5 battery/7 to 18 plug-in adaptor	-40° to +85°	87 at 200 mA	±4 over 2V to 3 V & over 0 to 200 mA	$4.95 (1,000s)
MAX722-3	—	3.25 W	2	0.85 to 5.5 battery/7 to 18 plug-in adaptor	-40° to +85°	87 at 200 mA	Same as above	$4.63 (1,000s)
MAX781	—	To 25 W	2	5 to 15 V	-40° to +85°	92 at 2 A	2	—
MAX782	—	To 50 W or mezzanine	3	5.5 to 30 V	-40° to +85°	95 at 2 A	2%	$5.95 (1,000s)
Micropac Industries, Inc., 905 E. Walnut St., Garland, TX 75040 (214) 272-3571, fax (214) 494-2281 Circle 253								
SME15/2805	Mil-Std-704, -461 with filter	15 W	1	17 to 40V	-55° to +125°	Greater than 78	±10/±20	—
SMP30/2805	Same as above	30 W	1	Same as above	-55° to +125°	Greater than 78	±20/±20	—
SMT15/2815	Same as above	15 W	3	Same as above	-55° to +125°	Greater than 76	±15, ±40/ ±50, ±45	—
SMP30/2815	—	30		17 to 40 V	-55° to +125°	82	10 & 25 mV	—
Modular Devices Inc., One Roned Rd., Shirley, NY 11967 (516) 345-3100, fax (516) 345-3106 Circle 254								
3080	Mil-Std-461,-704	5 W	Up to 3	28 Vdc	-55° to +125°	75	0.1/0.3	$445 (100s)
3041	Same as above	Up to 80 W	Up to 3	270 Vdc	-55° to +125°	Up to 85	0.1/0.3	$1,270 (100s)
3037	Mil-Std-704, -1275	37.5 W	Quad	28 Vdc	-55° to +85°	78	0.1/0.5	$539 (100s)
OECO Corp., 4607 SE International Way, Milwaukie, OR 97222 (503) 659-5999, (503) 653-6310 Circle 255								
20491	Mil-E-5400	96 W	15	+15 Vdc, +45 Vdc	-54° to +71°	66	—	—
20450	Mil-E-540T	20 W	3	+65 Vdc, ±15 Vdc	-57° to +85°	60	—	—
20290	Mil-E-5400	12.5 W	2	85 Vdc, 15 Vdc	-55° to +75°	60	—	—
Pentastar Electronics, Inc., 110 Wynn Dr., Huntsville, AL 35805 (205) 895-2076 Circle 256								
Curbside	—	1050	1	18 to 30 Vdc	-40° to +60°	90	±1	—

DC/DC CONVERTERS

Product name	Military specifications	Total output power	Number of outputs	Input voltage range	Temperature range (°C)	Efficiency (%)	Line/load regulation (%)	Price
Powercube Corp., 8 Surburban Park Dr., Billerica, MA 01821 (508) 667-9500, fax (508) 667-6280 Circle 257								
PJ-PAK	Mil-Std-454, -704, 810E, NAVMAT P-4855-1A	Up to 350 W	1	20 to 36 Vdc/100 to 200 Vdc	-55° to +100°	Up to 88	0.2/0.2	$518 (100s)
300HD-PAK	COTS	Up to 300 W	1	200 to 400 Vdc	-40° to +100°	Up to 90	0.2/0.2	$157 (100s)
300MM-PAK	COTS	Up to 125 W	1	200 to 400 Vdc	-40° to +100°	Up to 88	0.2/0.2	$100 (100s)
MICRO-Series	—	15 W & 25 W	1 & 2	16-36 Vdc/100-185 Vdc	-55° to +100°	Up to 81	.3/.3	$455 (100s)
28XW Series	—	Up to 100 W	1	15-60 Vdc	-55° to +100°	Up to 88	.2/.2	$314 (100s)
Rantec Microwave & Electronics Inc., 24003 Ventura Blvd., Calabasas, CA 91302 (818) 591-8189, fax (818) 591-8489 Circle 258								
HDM	Mil-E-5400, Mil-Std-810, Mil-S-901	250 W	Single, triple	24, 48, 300 Vdc	-40° to +95°	80	±1	$540 to $650
HD	Mil-S-9010, Mil-Std-810, -704	75, 300 W	Single, dual	270 Vdc	-55° to +95°	80	±1	$2,500 to $3,600
Raytheon Quincy Microelectronics, 465 Centre St., Quincy, MA 02169 (617) 984-8508, fax (617) 984-4193 Circle 259								
RY2805	Mil-Std-883	100 W	1	16 to 50 Vdc	-55° to +95°	80	10 mV	—
RY2812	Same as above	100 W	2	16 to 50 Vdc	-55° to +95°	82	10 mV	—
RY2815	Same as above	100 W	2	16 to 50 Vdc	-55° to +95°	83	10 mV	—
RY27005		Up to 100	1	180 to 330 Vdc	-55° to +95° Baseplate	>/-80	0.1	—
RO Associates, Inc., 246 Caspian Dr., Sunnyvale, CA 94089 (408) 744-1450 Circle 260								
MV48-5	—	200	1	36 to 72 Vdc	-55° to +100°	80	0.2	$225
MC28-T515	—	185	3	20 to 32 Vdc	-55° to +100°	75	0.2, 0.1	$350
MV300-28	—	252	1	220 to 440	-55° to +100°	82	0.2	$225
Sierra West Power Systems, Inc., 300 N. Telshor Blvd., Ste. 500, Las Cruces, NM 88011 (505) 522-8828, fax (505) 522-8828 Circle 261								
Hi-rel, ultra-mini	Mil-Std-883, Mil-C-39003, -55681	1.25 W	1 or 2	5 ot 28 V	-55° to +85°	65 to 80	—	—
SW750W-24VM/SW1000-24VM	Mil-Std-461, -810, -704D, 167-1	1,000 W	1	18 to 35 Vdc & 35 to 150 Vdc	-40° to +71°	90	0.5/0.2	—
SW-115	Mil-C-901C, Mil-Std-167-1, -704D	30, 50, 100 W	2 or 3	10 to 64 Vdc	-40° to +71°	85	0.1/0.1	—
SW115/12-12-5V	—	50W	3	12 to 150 Vdc & 90 to 300 Vac	-40° to +71°	75	0.1	—
Sigmapower Inc., 19060 S. Dominquez Hills Dr., Rancho Dominguez, CA 90220-6404 (310) 884-5200 Circle 262								
Series 600	—	650	1	120-180 Vdc	-55° to +71°	70	0.1	$2,000
Navy STD	—	50	1	27-37 Vdc	-55° to +85°	75	0.1	$850
Series 7000	—	50	3	11-14 Vdc; 22-30 Vdc	-40° to +70°	60	0.1	$680
Technipower, P.O. Box 222, Danbury, CT 06813 (203) 748-7001, fax (203) 797-9285 Circle 263								
300	Mil-Std-404D, -1275A, -461C	200 W	1, 3	20 to 36 Vdc	100°	80	0.05/1	$1,200 (100s)

DC/DC CONVERTERS

Product name	Military specifications	Total output power	Number of outputs	Input voltage range	Temperature range (°C)	Efficiency (%)	Line/load regulation (%)	Price
Tecnetics, Inc., 6287 Arapahoe Ave., Boulder, CO 80303 (303) 442-3837, fax (303) 444-9437 Circle 264								
70028	Mil-E-5400, -461, -704, -202	3 W	1	24 to 30 Vdc	-55° to +71°	92	—	$1,585
9500	Mil-Q-9858, -810	3, 6, 10 W	1 or 2	25 to 31 Vdc	-55° to +100°	51 (typical)	—	$260 to $375
71162	Mil-Q-9858, Mil-Std-202, -454, -461	44 W	3	18 to 32 Vdc	-29° to +71°	66 (min.)	—	$2,916
9020A	Mil-Std-2000, Mil-Std-810, Mil-Std-461	3 W	1 or 2	15 to 45 Vdc	-55° to +100°	85	4	—
9100A	Mil-Std-2000, Mil-Std-810, Mil-Std-461	2 W	1 to 3	16 to 32 Vdc	-55° to +100°	85	.1	—
71177	Mil-Std-2000, Mil-Std-810	20 W	5	3.9 to 16.0 Vdc	-55° to + 85°	60	.1	—
Teledyne Electronic Technologies, 12964 Panama St., Los Angeles, CA 90066 (310) 574-2065 Circle 265								
22941130-1	—	40	2 or 3	16 to 36 Vdc	-55° to +125	80	—	—
2294210	—	15	2 or 3	16 to 36 Vdc	-55° to +105	75 to 80	5, ±15	—
2297845	—	75	Single	16 to 36 Vdc or 11 to 36 Vdc	-55° to +125	80	3.5 Vdc	—
TESLAco—Optimum Power Conversion, Inc., 10 Mauchly, Irvine, CA 92718 (714) 727-1960, fax (714) 727-3789 Circle 266								
TCO-33-10	Yes	33 W	1	18 to 36 V	-55° to +85	85	—	—
TCO-50-10	Yes	50 W	1	42 to 56 V	-55° to +85	93	—	—
TCO-100-20	Yes	100 W	1	16 to 50 V, 36 to 90 V	-55° to +85	90	—	—
Transchem, P.O. Box 667, Corona, CA 91718-0667 (909) 371-5751, fax (909) 371-9602 Circle 267								
VM80-5	Mil-Std-810D, -461C	80 W	1	88 Vdc	-55° to +85	75	±2	Call
VM270	Mil-Std-810D, -704E	248 W	3	250 to 290 Vdc	-55° to +85	76	+5, -2.5	Call
VM330	Mil-Std-810D, -704E	346 W	3	22 to 29 Vdc	-55° to +85	77	±2	Call
VM330	Mil-Std-810E, -461C	346 W	3	22 to 29 Vdc	-55° to +85	76 to 77	±2	Call
VM100	—	100 W	1	18 to 33 Vdc	-55° to +90	79 to 80	±1	Call
Transistor Devices Inc., 85 Horsehill Rd., Cedar Knolls, NJ 07927 (201) 267-1900, fax (201) 267-2047 Circle 268								
—	Mil-Std-810D, -461	250 W	1	24 to 270	-30° to +55	80	0.1	$1,000
—	—	2 kW	1 to 4	24 to 270	-30° to +55	80	1	$5,000
—	—	8 kW	1 to 4	24 to 270	-30° to +55	80	1	$12,000
—	—	50 to 5kW	1 to 6	24 to 270	-40° to 60	90	.2	$2.00 per Watt
Military/Custom		254	1 to 5		-55° to +85	70	±1	$2,000
Varo Inc., 2800 W. Kingsley Rd., Garland, TX 75046-9015 (214) 840-5391, fax (214) 840-5151 Circle 269								
/4 APSP	Mil-P-29590/4	250 W	4	270 V	-54° to +85	80	1	Call
Power Converter Module	Mil-Std-5400, -461	200 W	1	270 V	-40° to +55	80	1	Call
Triple Output Module	Mil-Std-5400, Mil-Std-461	60 W	3	270 V	-40° to +55	60	1	Call

DC/DC CONVERTERS

Product name	Military specifications	Total output power	Number of outputs	Input voltage range	Temperature range (°C)	Efficiency (%)	Line/load regulation (%)	Price
Vicor Corp., 23 Frontage Rd., Andover, MA 01810 (508) 470-2900 or (800) 735-6200, fax (508) 475-6715 Circle 270								
MI-20	Mil-Std-810D, Mil-Std-704D/E	50 to 100 W	1	28, 155, 270 Vdc	-55° to +85	80 to 90	0.05	$525
MI-J00	Mil-Std-810D, Mil-Std-704D/E	10 to 50 W	1	28, 155, 270 Vdc	-55° to +100°	80 to 90	0.05	$440
Mi ComPac	Mil-Std-704A, Mil-Std-1275A, Mil-Std-461C	50 to 300 W	1 to 3	28, 155, 270 Vdc	-55° to + 85°	77 to 81	0.05	$762
Wilorco, Inc., 729 W. Anaheim St., #A, Long Beach, CA 90813 (310) 437-3428, fax (310) 495-0904 Circle 271								
Monitor Series II	Mil design, mil parts	150 to 200 W	1, 2 or 3	28 to 270 Vdc	-55° to +85°	Up to 87	1	$2,500
Monitor Series II	Mil design, non-mil parts	150 to 200 W	Same as above	Same as above	-40° to +85°	Up to 87	1	$1,200
MonitorSeries III	—	320W		190/350	-40° to +80°	85	1	Call Factory

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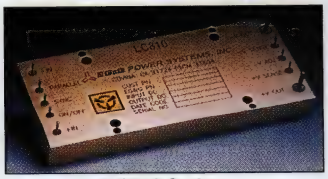

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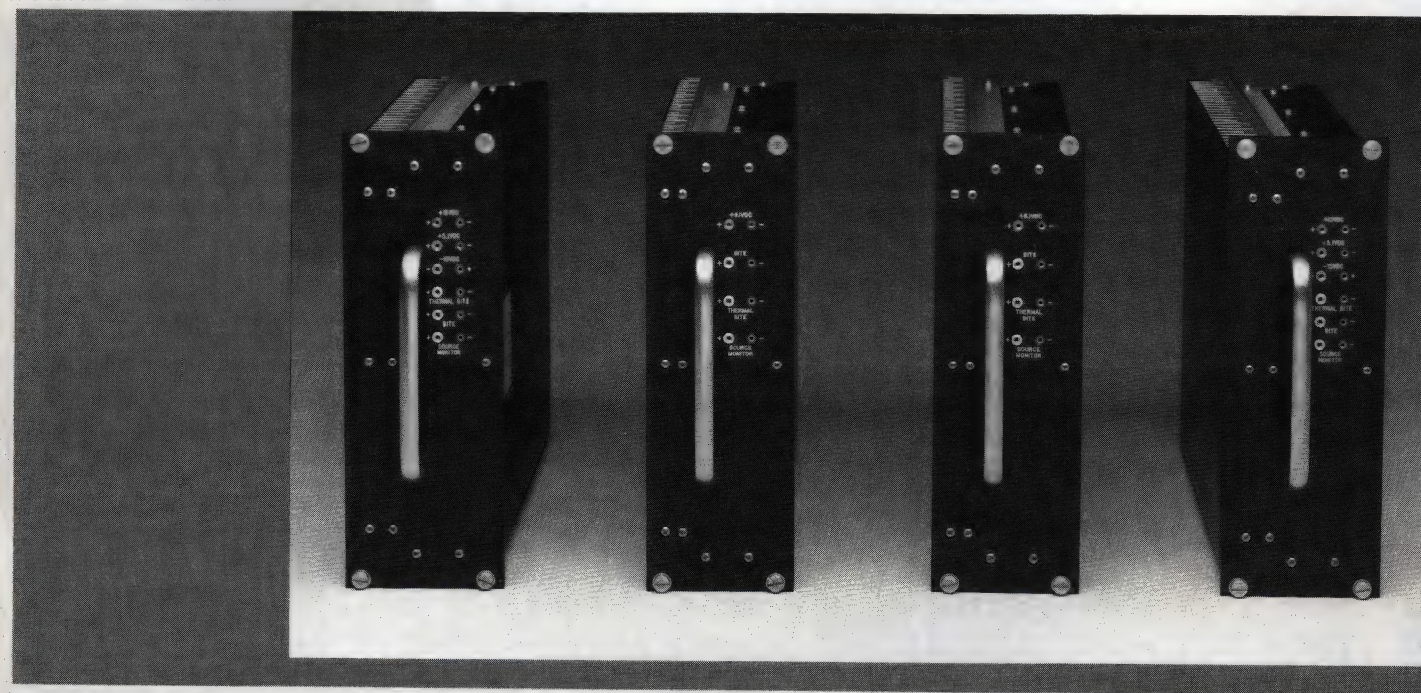

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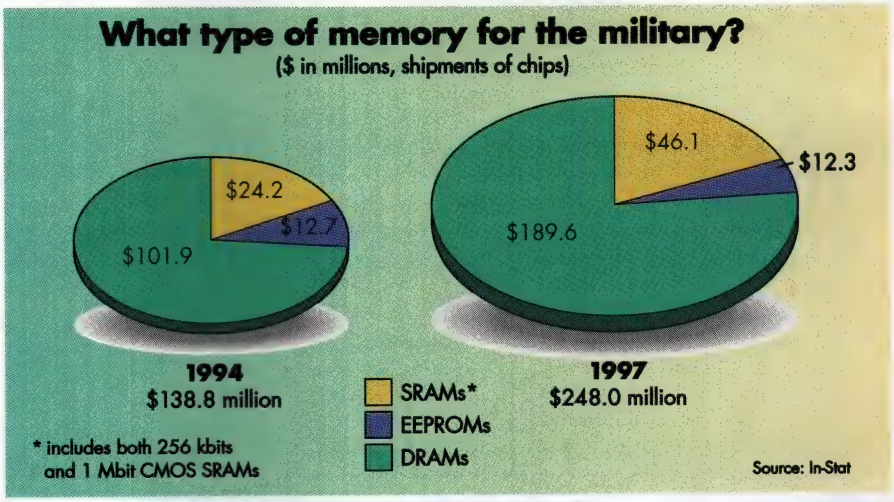
CIRCLE 28 ON READER SERVICE CARD

Solid-state gains ground

Solid-state storage systems are replacing tape and hard drive systems —especially in space.



Cheaper, faster, smaller, lighter. These are the criteria that are defining the competitive landscape for solid-state storage systems in the military and aerospace market. While price comparisons between solid-state, tape and hard drives still tend to favor the latter two, especially for large capacity units, solid-state devices are rapidly closing the gap.

In many front-line military and aerospace applications, solid-state is the storage medium of choice for other compelling reasons. For instance, because there are no moving parts, solid-state storage systems are inherently more rugged than their tape and disk drive cousins. And in applications requiring high degrees of security where quick erasability is a critical factor—such as recorders on board reconnaissance aircraft—solid-state systems are preferred.

While reliable market forecasts for solid-state storage systems in the military and aerospace market are hard to come by, one estimate puts the total market at about $350 million a year, with the military and aerospace sector accounting for about 30 percent. Within the military and aerospace sector, an area that holds particular promise is space applications.

There is some related data that points to healthy growth for solid-state storage systems. In-Stat Inc. (Scottsdale, Ariz.) forecasts solid growth in the military sector for DRAMs and SRAMs and a decline in flash EEPROM devices. While not exclusively destined for solid-state storage systems, military DRAM usage is projected to more than double from $101.9 million in 1994 to $260.6 million in 1998; SRAMs will grow more modestly from $43.4 million in 1994 to $46.1 in 1998; and the smaller military flash EEPROM market will decline from $12.7 million in 1994 to $12.3 million by 1997 as a result of falling unit price for the lower density chips even as demand remains stable.

As cost becomes increasingly important to the DoD, the price per Mbit of memory is taking on greater significance in the design decision. For all three of the common solid-state memory device types used in military and aerospace storage systems—DRAMs, SRAMs, and nonvolatile flash EEPROMs—price per Mbit is dropping rapidly.

Another factor critical in the success of solid-state storage systems is data transfer speed. Unlike capacity, which is dependent on advances in the devices, speed tends to be an architectural, system-level issue, typically solved through proprietary data handling and management techniques. Other important issues are fault tolerance and forward error correction, both of which are widely offered by system vendors.

FRAMs coming into their own

A new development for solid-state drives involve ferroelectric RAM (FRAM), which is being looked at as the ultimate in non-volatile RAM because it will have the speed of SRAM and the density of DRAM.

Some industry analysts label FRAM as the most promising non-volatile memory technology, even surpassing flash. The FRAM market is expected to grow from $100,000 in 1991 to $4 million in 1996, according to a report on the nonvolatile memory market from Electronic Trend Publications (Saratoga, Calif.).

Ferroelectric materials are those that display a spontaneous electric polarization that can be reversed or reoriented by application of an electric field.

Solid-state storage vendors are keeping a close eye on the burgeoning market for space-qualified systems as a dozen or so systems are coming up for bid in the next year. While the market is expected to develop first for custom DRAM-based units, many players have plans to offer standardized, modular solid-state storage systems in the future as the market matures. This strategy may open the space market up to the more traditional rugged off-the-shelf competitors, depending on how the market develops.

One trend that is working to the advantage of solid-state systems is NASA's intention of cutting back on the number of ground stations it employs.

There is no question that the future of off-the-shelf solid-state storage systems utilizing 3D memory cubes depends on the success of the early implementers, including the space recorder vendors. As the recorders catch on in space, insiders speculate that it is just a matter of time before they are designed into air, ground and sea applications where appropriate. M&AE

SOLID-STATE STORAGE

Model	Capacity (total memory in Mbytes)	Types of memory	Recording rate	Type of interface	Power requirements (volts)	Environmental characteristics (operating temperature C°)	Quality requirements	Price
Adtron Corp., 3050 Country Club, Ste. 24, Mesa, AZ 85210 (602) 929-9324 Circle 277								
SDD-R-PCC	64	Flash/SRAM	10 kbytes/s	RS-232; serial	16 to 24	-25° to +75°	—	$295
SDD-P-PCC	64	Flash/SRAM	700 kbytes/s	PC/104 AT bus	5 Vdc	Same as above	—	$275
SDD-B-PCC	64	Flash/SRAM	300 kbytes/s	IDE/AT bus	5 Vdc	Same as above	—	$250 to $325
Controlex Corp., 16005 Sherman Way, Van Nuys, CA 91406 (818) 780-8877 Circle 278								
CM331	96	DRAM	10 Mbits/s	SMD	117 Vac @ 60 Hz	0° to +70°	Mil-I-45208	$200/Mbyte (typ.)
CM336	16 Gbytes	DRAM, SRAM, FRAM	10 to 100 Mbytes/s	SCSI-2, HiPPI, -1553	+5 Vdc	Same as above	Same as above	$100/Mbyte (typ.)
CM335	No limit	Any VME memory	80 Mbytes/s	SCSI-2, VME	+5 Vdc	Same as above*	Same as above	$3,500 (Qty. 1)
CM338	150	DRAM, battery-backed	0.5 Mbits/s	Serial	+5 Vdc	0° to +70°	Same as above	Contact Controlex
EPS, Inc., 26351 Curtiss-Wright Pkwy, Cleveland, OH (216) 289-4115, fax (216) 289-4116 Circle 279								
RS422	8 to 500+	Flash	300 kbytes/s	RS-422	+5 Vdc, +15 Vdc	-40° to +85°	Mil-Q-9858, Mil-I-45208, Mil-Std-461	Contact EPS
SCSI	8 to 320	Flash	300 kbytes/s	SCSI	+5 Vdc, +15 Vdc or +28 Vdc	Same as above	Same as above	Contact EPS
1553	8 to 320	Flash	300 kbytes/s	-1553	+5, +15 Vdc, -15 Vdc	Same as above	Same as above	Contact EPS
EUROM Flashware Solutions Inc., 4655 Old Ironsides Dr., Ste. 200, Santa Clara, CA 95054 (408) 748-9995, fax (408) 748-8408 Circle 280								
Disk On Chip	1 to 16	Flash	280 kbits/s	—	5	0° to +70°	—	$16
Fairchild Space and Defense Corp., 20301 Century Blvd, Germantown, MD 20874 (301) 428-6477, fax (301) 428-6885 Circle 281								
FMS3PC	60 to 480	Flash	2 Mbytes/s (read); 600 kbytes?/s (write)	IDE	5, 12	-25° to +85°	Best Commercial Practices	Call Fairchild
FMS3SC	60 to 480	Flash	4 to 10 Mbytes (read); 1 to 10 (write)	SCSI-2	5, 12	-25° to +85°	Same as above	Call Fairchild
M-Systems Flash Disk Pioneers, 4655 Old Ironside Dr., Santa Clara, CA 95054 (408) 654-5820, fax (408) 654-9107 Circle 282								
PC Flash Disk	1 to 32	Flash	Up to 800 kbytes/s	8-bit ISA	+5 Vdc	0° to +65°	ISO-9000	Starts at $124
SCSI Flash Disk	16 to 320	Flash	300 kbytes/s	SCSI-2	12.5 W @ 5V	-55° to +85°	Mil-Std-810, -461, -883, -2000A, Mil-Q-9858	Call M-Systems
Fast SCSI Flash Disk	320 to 512	Flash	2.5 Mbytes/s	SCSI-2	40 W @ 5V	-55° to +71°	Same as above	Call M-Systems
Flash DTU	16 to 48	Flash	Up to 288 kbytes/s	Tape emulation, RS-232, RS-422, PC-ISA bus	15W @ 28V	-55° to +85°	Same as above	Call M-Systems

SOLID-STATE STORAGE

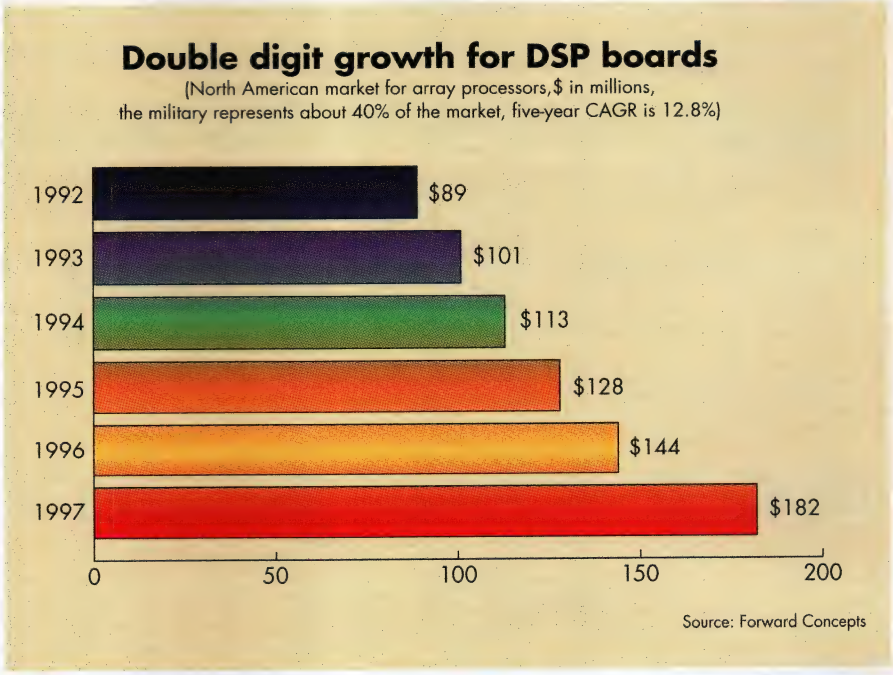
Model	Capacity (total memory in Mbytes)	Types of memory	Recording rate	Type of interface	Power requirements (volts)	Environmental characteristics (operating temperature C°)	Quality requirements	Price
MemTech, 1257-A Tasman Dr., Sunnyvale, CA 94089 (408) 745-1600, fax (408) 745-1733 Circle 283								
PCB902	2	SRAM/Flash	1,024 kbytes/s	PC/XT/AT	+5	0° to +70°	—	$952 (Qty. 1)
PCE910	4	EEPROM	1,024 kbytes/s	PC/XT/AT	+5	Same as above	—	$1,141 (Qty. 1)
PCF912	2	Flash	80 kbytes/s	PC/XT/AT	+5	Same as above	—	$823 (Qty. 1)
SSD920	2 to 12	Flash	80 kbytes/s	SCSI	+5	Same as above	—	$978 to $3,113 (Qty. 1)
PCF932	2 to 32	NAND EEP-ROM	80 kbytes/s	PC/XT/AT	+5	Same as above	—	$463 to $2,884 (Qty. 1)
I25/96	24 to 96	NAND EEP-ROM	250 kbytes/s	IDE	+5	Same as above	—	—
SC3548/xxx	24 to 432	NAND EEP-ROM	250 kbytes/s	SCSI	+5	Same as above	—	$2,363 to $28,241 (Qty. 1)
MicroComputer Specialists, Inc. (MCSI), 2598 Fortune Way, Vista, CA 92083 (619) 598-2177, fax (619) 598-2450 Circle 284								
IND486DX	16	EPROM, SRAM, Flash EPROM	+600 kbytes/s	ISA	+5, ± 12 Vdc	0° to +70°	—	$596
Promdisk III	1	Same as above	+600 kbytes/s	ISA	+5, + 12 Vdc	Same as above	—	$139
Promdisk IV	4	Same as above	+600 kbytes/s	ISA	Same as above	Same as above	—	$209
EPROM/RAM Board	192 kbytes	EPROM, SRAM, NVRAM	+600 kbytes/s	ISA	+5 Vdc	Same as above	—	$69
IND386SX	4	EPROM, SRAM, Flash EPROM	+600 kbytes/s	ISA	+5 Vdc, ±12 Vdc	Same as above	—	$595
IND486SLC	4	EPROM, SRAM, Flash EPROM	+600 kbytes/s	ISA	+5 Vdc, ±12 Vdc	Same as above	—	$675
Miltope Corp. Inc., 1770 Walt Whitman Rd., Melville, NY 11747 (516) 420-0200 Circle 285								
CR513	2 to 230	Flash	1 Mbyte burst	SCSI, parallel RS-232, -422, -449	+5 Vdc	-55° to +85°	Mil-Q-9858	$300 to $500/Mbyte
NAI Technologies—Military Products Division, 60 Plant Rd., Hauppauge, NY 11788-3890 (516) 582-6500 Circle 286								
Model 2100 Flash Disk	2.6 to 42	Flash	60 kbytes (sustained)	IDE	5	-20° to +60°	Mil-I-45208	$800 to $4,500
Model 2200 PCMCIA Flash Disk	2.6 to 10	Flash	Same as above	PCMCIA Rev. 1.0, 2.0	5	Same as above	Mil-I-45208	$500 to $2,000
Solid-State Memory Module	2 to 32	Flash	8 Mbytes/s	Memory addressable interface	—	-20° to +90°	Mil-I-45208, Mil-Q-9858A	$2,200 to $4,100

SOLID-STATE STORAGE

Model	Capacity (total memory in Mbytes)	Types of memory	Recording rate	Type of interface	Power requirements (volts)	Environmental characteristics (operating temperature C°)	Quality requirements	Price
Radisys Corp., 15025 SW Koll Pkwy, Beaverton, OR 97006 (800) 950-0044, fax (503) 646-1850 Circle 287								
EXM-SSD	Flash: 10, 40	Flash	60 kbytes/s (write); 650 kbytes/s (read)	IDE	+5	—	ISO-9000	$1,744 to $4,470
EXM-2A	9	SRAM, DRAM	11 kbytes/s (write/read)	IDE	+5	—	ISO-9000	$360 to $1,210
Raymond Engineering, Inc., Memory Systems Division, 217 Smith St., Middletown, CT 06457 (203) 632-4582 Circle 288								
9400 Series	1.5 to 1 Gbyte	Flash	50 kbytes/s to 1.5 Mbytes/s	PCMCIA, SCSI	+5 Vdc	To Mil-E-5400	Mil-Q-9858	Contact Raymond
SeaLevel Systems, Inc., P.O. Box 830, 102 W. Main St., Liberty, SC 29657 (803) 843-4343, fax (803) 843-3067 Circle 289								
3070	1	Flash/EPROM /SRAM	—	PC	—	0° to +50°	—	$159
3072	3	Flash/EPROM /SRAM	—	PC	—	Same as above	—	$299
Targa Electronic Systems, One Annabel Ln., San Ramon, CA 94583 (510) 277-0188, fax (510) 277-0196 Circle 290								
IDE-SB	80	Flash	60 kbytes/s (sustained)	IDE	+5 Vdc	-40° to +85°	Mil-I-45208	$1,190
SCSI-SB	300	Flash	Same as above	SCSI, SCSI-2	+5 Vdc	-40° to +85°	Same as above	$1,690
CDR-SB	40	Flash	60 kbytes/s	Serial, SCSI	28 Vdc	-40° to +85°	Same as above	$3,750
POD-SB	120	Flash	Same as above	Same as above	+5 Vdc/+12 Vdc	Same as above	Same as above	$3,450
Series 2	40	Flash	60 kbytes/s (sustained)	IDE, SCSI, Serial	+5 Vdc	Same as above	Same as above	$1,390
Series 1	120	Flash or CMOS	Up to 1 Mbytes/s	SCSI, Serial, Parallel	+5 Vdc	Same as above	Same as above	Contact Targa
Texas Instruments, 13532 N. Central Expwy., MS-88, Dallas, TX 75265 (214) 995-1295 Circle 291								
SSR-1	9.6 Gbits	SRAM, DRAM, Flash	10 Mbits/s	Serial	5	Meets Mil-Std-810	Mil-Q-9858	Contact TI
MCMM	80 Mbits	SRAM	8 Mbits/s	Parallel	5	—	Same as above	Contact TI

Off-the-shelf drives mil/aero DSP board business

DSP boards that plug into open-architecture buses are displacing proprietary signal-processing systems in military and aerospace applications. The trend will continue as the DoD pursues performance-driven, rather than spec-driven, procurement policies.



Digital signal processors have proven invaluable for implementing complex signal-processing algorithms in applications ranging from simulation and training to radar beam forming. Increasingly, those DSPs are finding their way into such applications on board standard computer buses. These buses offer economies of scale without performance sacrifice.

Even though VMEbus is the bus of choice for most military and aerospace applications, vendors cannot ensure success simply by populating VMEbus boards with DSPs. They must address several issues:

- Is VMEbus the best choice for a given application? What are the possible upgrade paths from the 32-bit VMEbus?
- Are there any technologies derived from the low-cost, high-volume personal-computer industry that would prove to be cost effective yet meet the performance and environmental requirements of military customers?
- Which DSPs best fit the application? Should the vendor concentrate on one DSP family, thereby focusing its expertise, or should it attempt to support many, thereby achieving sufficient flexibility to best meet a range of applications?
- How can vendors best implement high-bandwidth I/O and interprocessor communication on multiprocessor, multiboard systems?
- How can they best provide software-development support? Ada and other high-level languages lie in the middle of a broad spectrum of tools for DSP systems. For some applications, hand optimized assembly code may be the best choice. For others, very high-level visual programming tools might be required to get multiprocessor DSP boards and systems delivered on time.

Development vs. target

According to analyst Will Strauss at Forward Concepts (Tempe, Ariz.), DSP-based standard-bus systems fall into two categories: first, general-purpose boards; and second, array processors. The former often plug into personal computers and serve as development platforms; they made up 45.6 percent of the $300 million world market in 1993, 10 percent of which Strauss attributes to military applications.

Array processors plug into target systems and make up the remainder of the market—a 54.4 percent share in 1993. That share was dominated by boards (62.7 percent), notes Strauss, but also included boxes (9.9 percent), workstations (11.8 percent), and software (15.5 percent). Strauss attributes 40 percent of array-processor sales to military applications and 30 percent to medical applications. M&AE

DIGITAL SIGNAL PROCESSING BOARDS

Product name	Type of DSP chip	Fixed or floating point?	Peak MFlops	1k Fast Fourier Transform (FFT in ms)	I/O capabilities: A) internal I/O rate	B) Interboard I/O (Point-to-point and aggregate peak)	Platforms	Price (quantity=1)
Adaptive Solutions, 1400 N.W. Compton Dr., Suite 340, Beaverton, OR 97006 (503) 690-1236, fax (503) 690-1249 Circle 297								
CNAPS/VME	Adaptive Solutions CNAPS 1064 up to 512 processors	Fixed	N/A	320M to 10 Billion mul accumulates	20 MB/s	20 MB/s	VME	$6,000-$43,000
CNAPS/PC	Adaptive Solutions CNAPS-1016 up to 128 processors	Fixed	N/A	320M to 2.56 Billion mul accumulates	20 MB/s	160 MB/s	PC AT (all processors)	$3,000-$7,000
Alacron, Inc., 71 Spitbrook Rd., Suite 204, Nashua, NH 03060 (603) 891-2750, fax (603) 891-2745 Circle 298								
FT200	Intel i860 XP	Floating	200	310ms	200 MB/s	40 MB/s	6U VME & PC/ISA	$8,495
AL860	Intel i860 XR	Floating	80	720ms	160 MB/s	40 MB/s	6U VME & PC/ISA	$2,995
Ariel Corp., 433 River Rd., Highland Park, NJ 08904 (908) 249-2900, fax (908) 249-2123 Circle 299								
V-C40 Hydra	4 50-MHz TMS320C40 DSPs	Floating	200	2.2ms	1.1 GB/s	20 MB/s (point-to-point) 270 MB/s (aggregate)	VMEbus	$15,495
Hydra II	4 50-MHz TMS320C40 DSPs	Floating	200	2.2ms	1.1 GB/s	100 MB/s (point-to-point) 550 MB/s (aggregate)	VMEbus	$8,995
CommIO	32-MHz TMS320C40	Floating	32	2.2ms	128 MB/s	16 MB/s (point-to-point) 64 MB/s (aggregate)	VMEbus	$2,795
PC-Hydra	4 50-MHz TI TMS320C40 DSPs	Floating	200	2.2ms	1 GB/s	20 MB/s (point-to-point) 260 MB/s (aggregate)	ISA/EISA	$9,995
TeraDON	16 66.7-MHz AT&T DSP3210 DSPs	Floating	533	1.9ms	176 MB/s	180 MB/s (point-to-point) 232 MB/s (aggregate)	ISA/EISA	$9,995
Array Microsystems, 1420 Quail Lake Loop, Colorado Springs, CO 80906-4650 (719) 540-7900, fax (719) 540-7950 Circle 300								
a66540 FDaP	a66111, DaSP, a66212, PaC Array parts	Block Floating	400	132.7ms	40 MHz	20 MHz max sustained complex rate	VMEbus 6U	$10,900 +
a66580 PC-FDaP	a66111, DaSP, a66212, PaC Array parts	Block Floating	250	209.9ms	25 MHz	15 MHz	IBM PC AT	$4,995 +
a66531	a66110, DaSP, a66110, PaC Array parts	Block Floating	250	209.9ms	25 MHz	15 MHz	VMEbus 9U	$9,900 +
Communication Automation & Control, Inc., 1642 Union Blvd. - Suite 200, Allentown, PA 18103 (800) 367-6735, fax (610) 770-1232 Circle 301								
VME6U6	AT&T DSP32C	Floating	150	3.4	64 M bps	16 M bps (point-to-point) 64 M bps (aggregate)	VME 6U	$8,900
VME9U12	AT&T DSP32C	Floating	300	3.4	64 M bps	16 M bps (point-to-point) 64 M bps (aggregate)	VME 9U	$17,000
SB32C2	AT&T DSP32C	Floating	50	3.4	25 M bps	N/A	S-BUS	$2,500
V3-D0-00	AT&T DSP32C	Floating	25	3.4	25 M bps	N/A	ISA Bus	$1,350
P3210A6	AT&T DSP3210	Floating	33	2.6	33 M bps	N/A	PC MCIA	$1,400
CSPI, 40 Linnell Circle, Billerica, MA 01821 (508) 663-7598, fax (508) 663-0150 Circle 302								
SC-4SLX	Intel i860 (8)	Integer & Floating	640	.51 (real)	320 MB/s	Quick Ring VSB -1 GB/s	VME 6U Sun Motorola Heuricon Power PC	$25,000

DSP raised to the power of eight!

Mizar leads the market with another VME DSP first - the market's only single-slot, 6U implementation power-packed with eight TI `C40 chips all on the motherboard! Designed in conjunction with Texas Instruments, Defense Systems & Electronics Group, Mizar's MZ 7772 features state-of-the-art TAB packaging, a Harvard architecture memory option and I/O expansion up to 800 Mbytes/sec.

More Mizar DSP Solutions . . .

High performance mil-spec and commercial products complete Mizar's comprehensive line of VME DSP solutions. The mil-spec MZ 7775 delivers the massive performance of four TI `C40 DSPs, plus Ada and C source code debuggers. And the MZ 7770 Quad `C40 provides 200 MFLOPS of DSP power and 240 Mbytes/sec of flexible I/O.

For more information call:

1-800-635-0200

MIZAR

Your Source for Solutions

2410 Luna Road
Carrollton, TX 75006
(214) 277-4600 (214) 277-4666 FAX
email: info@ mizarvme.com

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DIGITAL SIGNAL PROCESSING BOARDS

Product name	Type of DSP chip	Fixed or floating point?	Peak MFlops	1k Fast Fourier Transform (FFT in ms)	I/O capabilities: A) internal I/O rate	B) Interboard I/O (Point-to-point and aggregate peak)	Platforms	Price (quantity=1)
CSPI, 40 Linnell Circle, Billerica, MA 01821 (508) 663-7598, fax (508) 663-0150 Circle 302 *(continued)*								
SC3-XL	Intel i860 (2)	Integer & Floating	200	.39 (real)	200 MB/s	VSB + VME64 72MB	VME 6U Sun Motorola	$14,000
SC-2XL	Intel i860 (2)	Integer & Floating	160	.51 (real)	160 MB/s	VSB + VME64 40 MB	VME 6U Sun Motorola	$8,000
DY 4 Systems Ltd., 1475 S. Bascom Ave., Suite 202, Campbell, CA 95008 (408) 377-9822, fax (408) 377-4725 Circle 303								
SVME/DMV-442	40 MHz Quad TMS320C40	Floating	160	0.4 ms	40 MB/s per C40	80 MB/s unbuffered, 44 MB/s buffered	VME air-cooled and conduction cooled	$12,663
SVME/DMV-674	40 MHz Single TMS320C40	Floating	40	1.5ms	27 MB/s Video RAM interface	40 MB/s unbuffered, 22 MB/s buffered	VME air-cooled and conduction cooled	$8,946
Impact Technologies, 2082-B Walsh Ave., Santa Clara, CA 95050 (408) 988-4980, fax (408) 988-5049 Circle 304								
Viper 8704 Series	4 Zoran 34161	Block Floating	400	0.975 ms continuous rate including I/O	>100 Mbytes/s	100 Mbytes/s	VMEbus	$9,000-$15,000
SunSpot916	Plessy 15C51x series	Block Floating	450	0.100ms	>80 Mbytes/s	30-60 Mbytes/s (depends on Unix)	Sun Sparc platforms (any with Sbus slot)	$9,000
Integrated Systems, Inc., 3260 Jay Street, Santa Clara, CA 95054 (408) 980-1500, fax (408) 980-0400 Circle 305								
AC100 Model C30	TMSC30	Floating	33	N/A	N/A	10 MB/s local I/O bus	PC Hosted	$13,000 +
Lockheed Sanders Communications, NHQ1-735 Box 868, Nashua, NH 03061-0868 (603) 885-2813, fax (603) 885-2817 Circle 306								
Signal Processor Module (SPM)	Quad, Intel i860xr	Floating Point	320	0.74 (per node)	640 MB/s	160 MB/s, 320 MB/s aggregate	Embedded VME	Call
Champ	FPGA based processing element	Fixed	5 Bops	N/A	760 MB/s	100 MB/s	Embedded VME	Call
Loral Rolm Computer Systems, 3151 Zanker Road, San Jose, CA 95134 (408) 432-7925, fax (408) 432-7961 Circle 307								
Digital XPRESS™ DXP4 (Quad) Module	Intel i860	Floating	320	0.74 (complex) 0.43 (real)	160 MB/s per channel (2 channels)	160 MB/s (point-to-point), 1,280 MB/s (aggregate)	VME 6U rugged and milspec configurations	Contact Manufacturer
Digital XPRESS™ DXP8 (Octal) Module	Intel i860	Floating	640	0.74 (complex) 0.43 (real)	160 MB/s per channel (2 channels)	160 MB/s (point-to-point), 2,560 MB/s (aggregate)	VME 6U rugged and milspec configurations	Contact Manufacturer
MIL-Hydra II	TI TMS320C40	Floating	200	1.93 (complex) 1.27 (real)	160 MB/s	20 MB/s (point-to-point), 320 MB/s (aggregate)	VME 6U rugged and milspec configurations	Contact Manufacturer
Mercury Computer Systems, 199 Riverneck Road, Chelmsford, MA 01824-2820 (508) 256-1300, fax (508) 256-3599 Circle 308								
RACE MCV9	Intel i860	Floating	1280*	.740ms	1.28 GB/s, 1.2 GB/s sustained	160 MB/s (point-to-point), 1.28 GB/s (aggregate)	Sun4 300, 400, & 600 Series, Force CPU 2CE MVME 133,147, &167	$108,800 +
RACE MCV6	Intel i860	Floating	320**	.740ms	320 MB/s, 300 MB/s sustained	160 MB/s (point-to-point), 1.28 GB/s (aggregate)	Sun4 300, 400, & 600 Series, Force CPU 2CE MVME 133,147, &167	$30,200 +

* MFlops fully-configured 9U board
**MFlops fully-configured 6U board

DIGITAL SIGNAL PROCESSING BOARDS

Product name	Type of DSP chip	Fixed or floating point?	Peak MFlops	1k Fast Fourier Transform (FFT in ms)	I/O capabilities: A) internal I/O rate	B) Interboard I/O (Point-to-point and aggregate peak)	Platforms	Price (quantity=1)
MIZAR, Inc., 2410 Luna Road, Carrollton, TX 75006 (800) 635-0200, fax (214) 277-4666 Circle 309								
MZ 7772 Octal DSP Engine	TI TMS320C40	Floating	400	0.55	240 MB/s	240 MB/s	Sun/PC	$24,995
MZ 7772 Quad DSP Engine	TI TMS320C40	Floating	200	0.89	120 MB/s	120 MB/s	Sun/PC	$9,375
MZ 7775	SMJ320C40	Floating	160	1.11	240 MB/s	VSB	Sun/PC	$25,705
Momentum Data Systems, 1520 Nutmeg Place, Suite 108, Costa Mesa, CA 92626 (714) 557-6884, fax (714) 557-6969 Circle 310								
Eagle-56 I	Motorola DSP56002	Fixed	33 MIPS	1.5	4 channel @ 48kHz sample rate	TBD	ISA Bus	$2,995
Eagle 56-P	Motorola DSP56002	Fixed	33 MIPS	1.5	4 channel @ 48kHz sample rate	TBD	PCI Bus	$2,995
Pentek, Inc., 55 Walnut Street, Norwood, NJ 07648, (201) 767-7100, fax (201) 767-3994 Circle 311								
Model 4270	Quad 'C40 TI TMS320C40	Floating	200	0.194	800 MB/s	120 MB/s (point-to-point) 240 MB/s (aggregate)	VMEbus	$11,995
Model 4269	Dual 'C40 TI TMS320C40	Floating	100	0.388	400 MB/s	60 MB/s (point-to-point) 120 MB/s (aggregate)	VMEbus	$6,995
Model 4284	'C40 TI TMS320C40	Floating	50	0.776	200 MB/s	60 MB/s (point-to-point) 120 MB/s (aggregate)	VMEbus	$6,495
Model 4283	'C30 TI TMS320C40	Floating	40	0.991	116 MB/s	16 MB/s (point-to-point) 16 MB/s (aggregate)	VMEbus	$4,995
Model 4280	Dual 'C31 TI TMS320C31	Floating	80	0.495	200 MB/s	0 MB/s (point-to-point) 0 MB/s (aggregate)	VMEbus	$4,995
Radstone Technology, 50 Craig Road, Montvale, NJ 07645 (201) 391-2700, fax (201) 391-2899 Circle 312								
VSP-1	2 Intel i860XRs, 1 Intel i960	Floating	160*	0.8ms	VME, VSB, RS423 160 MB/s	20 MB/s	VME, VSB	$20,900
		* MFlops sustained						
SKY Computers, Inc., 27 Industrial Ave., Chelmsford, MA 01824 (508) 250-1920, fax (508) 250-0036 Circle 313								
SKYbolt I 6U	4 Intel i860s	Floating	320	.438ms/processor	80-640 MB/s	40 MB/s	6U	$10,000-$30,000
SKYbolt I 9U	16 Intel i860s	Floating	1280	.438ms/processor	320-640 MB/s	40 MB/s	9U	$20,000-$100,000
SKYbolt II 6U	4 Intel i860s	Floating	320	.438ms/processor	320-640 MB/s	40 MB/s	6U	$15,000-$35,000
SONITECH International, Inc., 14 Mica Lane, Wellesley, MA 02181 (617) 235-6824, fax (617) 235-2531 Circle 314								
SPIRIT-30 AT/ISA	TI TMSC30	Floating	33	1.3 (real) 2.6 (complex)	16 MB/s (ASM-P) 8 Mb/s each on each (ASM-S)	3.3 MB/s (ISA) >16 MB/s (SBus)	PC	Call
	TI TMSC30	Floating	40	1.1 (real) 2.2 (complex)	2 ASM-S ports @ 10 Mb/s 1 ASM-P port @ 40 MB/s	>13 MB/s (VMEbus block)	SPARC	$3,995
	TI TMSC30	Floating	33	1.3 (real) 2.6 (complex)	1 ASM-p ports @ 16 MB/s 2 ASM-S ports @ 8 Mb/s each	3.3 MB/s (ISA)	VME	Call
SPIRIT-30 SBUS	TI TMSC40	Floating	80/100	1.01 (real) 1.54 (complex)	10 ASM-C ports @ 20 MB/s each	—	PC	$5,995

DIGITAL SIGNAL PROCESSING BOARDS

Product name	Type of DSP chip	Fixed or floating point?	Peak MFlops	1k Fast Fourier Transform (FFT in ms)	I/O capabilities: A) internal I/O rate	B) Interboard I/O (Point-to-point and aggregate peak)	Platforms	Price (quantity=1)
SONITECH International, Inc., 14 Mica Lane, Wellesley, MA 02181 (617) 235-6824, fax (617) 235-2531 Circle 314 *(continued)*								
SPIRIT-30 SBUS	TI TMSC31	Floating	33	1.3 (real) 2.6 (complex)	—	—	PC or VME	$695
SPIRIT-30 VME	TI TMSC30	Floating	32	1.3 (real) 2.6 (complex)	—	VMEbus interface >6 MB/s single	PC or VME	Call
	TI TMSC40	Floating	80/ 100	1.01 (real) 1.44 (complex)	12 ASM-C ports @ 20 MB/s each 2 ASM-Mbus interfaces @ 50 MB/s each RS 232 IF to 38.4 kband	>18 MB/sec block	VME	Call
	TI TMSC40	Floating	160/ 200	1.01 (real) 1.44 (complex)	12 ASM-C ports @ 20 MB/s each 2 ASM-Mbus interfaces @ 50 MB/s each RS 232 IF to 38.4 kband	—	VME	Call
Spectrum Signal Processing, Inc., #100-8525 Baxter Place, Burnaby, BC V5A 4V7 (604) 421-5422, fax (604) 421-1764 Circle 315								
QPC 40 Processor Board	TMS320C40	Floating	400	0.77616ms (real) 1.5578ms (complex)	320MB/s	240MB/s	PC	TIM Module Dependent
C31 Real Time Applications Board	TMS320C31	Floating	33	0.991ms (real) 2.534ms (complex)	N/A	1MB/s	PC	$2,195
C50 System Board	TMS320C50	Fixed	28.6 MIPS	2.19ms	N/A	1.8MB/s	PC	$2,695
CV4 6U VME	TMS320C40	Floating	400	0.77616ms (real) 1.5578ms (complex)	320MB/s	240MB/s	VME	TIM Module Dependent
CV2 6U VME MASTER Quad C40 TIM Carrier Board	TMS320C40	Floating	200	0.77616ms (real) 1.5578ms (complex)	50MB/s	160MB/s	VME	TIM Module Dependent
Universal Computing, 4711 Viewridge Avenue, San Diego, CA 92123-1669, (619) 576-0592, fax (619) 576-9017 Circle 316								
Quatro860	Intel i860 xr	Floating	320	Real .441msec., Complex .782 msec.	160 MB/s	VME, VME64, VSB 57 MB/s	Solbourne; Sun4 300, 400 & 600; Force 1E,2CE, 3CE, 10; Sunsparc 10; Motorola 133, 147, 167; Themis MP10; Sun O/S 4.1.3; Solaris 2.3; 6u VME	$8,500 - $29,000
SBus860	Intel i860xr	Floating	80	Real .441 msec., Complex .782 msec.	160 MB/s	SBus 80 MB/s	All space stations; Force w/ SBus slots; Themis w/SBus slots; Sun O/S 4.1.3; Solaris 2.3	$6,670

MIZAR in association with TEXAS INSTRUMENTS

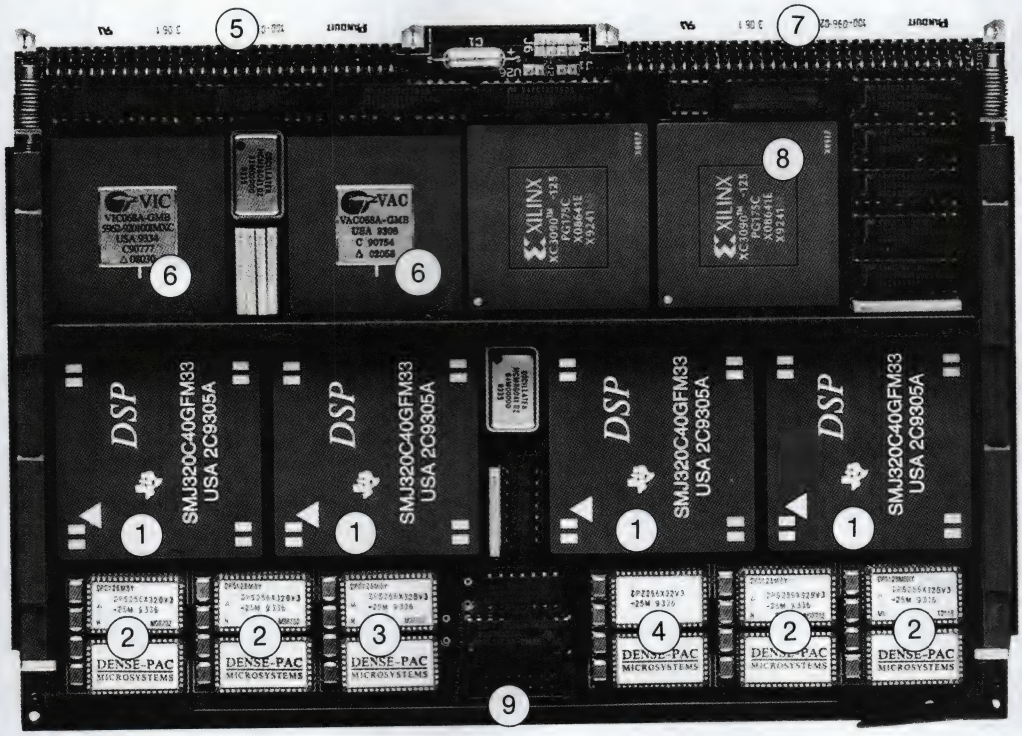
Mil Spec Quad 'C40 DSP Engine

MZ 7775

The Mizar MZ 7775 Quad 'C40 DSP Engine is based on Texas Instruments' SMJ320C40 digital signal processor (DSP) and is designed to conform fully with IEEE specifications 1101.2 and 1156.1.

The MZ 7775 is a high performance and scaleable DSP board for the VMEbus. It is ideally suited for many of the most demanding military applications including command, control, communications and intelligence (C3I) as well as many general purpose applications.

Designed by Texas Instruments Defense Systems & Electronics Group, the MZ 7775 can have as many as four 'C40 processors, each with as much as two Mbytes of zero wait state static random access memory (SRAM). As well, each MZ 7775 can be configured with two Mbytes of global memory which is accessible by all four processors for a total of 10 Mbytes of SRAM per board. In the aggregate, the MZ 7775's four processors can achieve a peak performance of some 160 MFLOPS (million floating point operations per second).



1 SMJ320C40
2 'C40 Private SRAM
3 Global SRAM
4 Flash EEPROM
5 VMEbus connector
6 VMEbus controller
7 P2 connector
8 Programmable 32-bit Interface (Xilinx 3090)
9 JTAG boundary scan interface

Features

Standard features of the MZ 7775 include: four 40 MHz SMJ320C40 digital signal processors; one Mbyte of global 32-bit wide SRAM and one Mbyte of private 32-bit wide zero wait state SRAM for each 'C40 (for a total of 5 Mbytes of SRAM per board); one Mbyte of 32-bit wide Flash EEPROM; an A32/A24, D32/D16 VMEbus master/slave interface; a VSB master/slave interface; six 20-Mbytes/second inter-processor communications ports per 'C40 processor; one global bus which interfaces to shared memory as well as a programmable Xilinx 3090 gate array for I/O access out of the P2 connector (The Xilinx gate array is programmed with VSB as a standard feature.); a VMEbus interface, one serial port and one JTAG boundary scan test interface.

Options include bringing four communications ports out the P2 connector. In addition, the MZ 7775 can be fabricated with one, two, three or four 'C40 processors.

All of the stiffeners, ejectors, wedge lock expanders and optional keyed connectors defined in military specifications are included on the MZ 7775.

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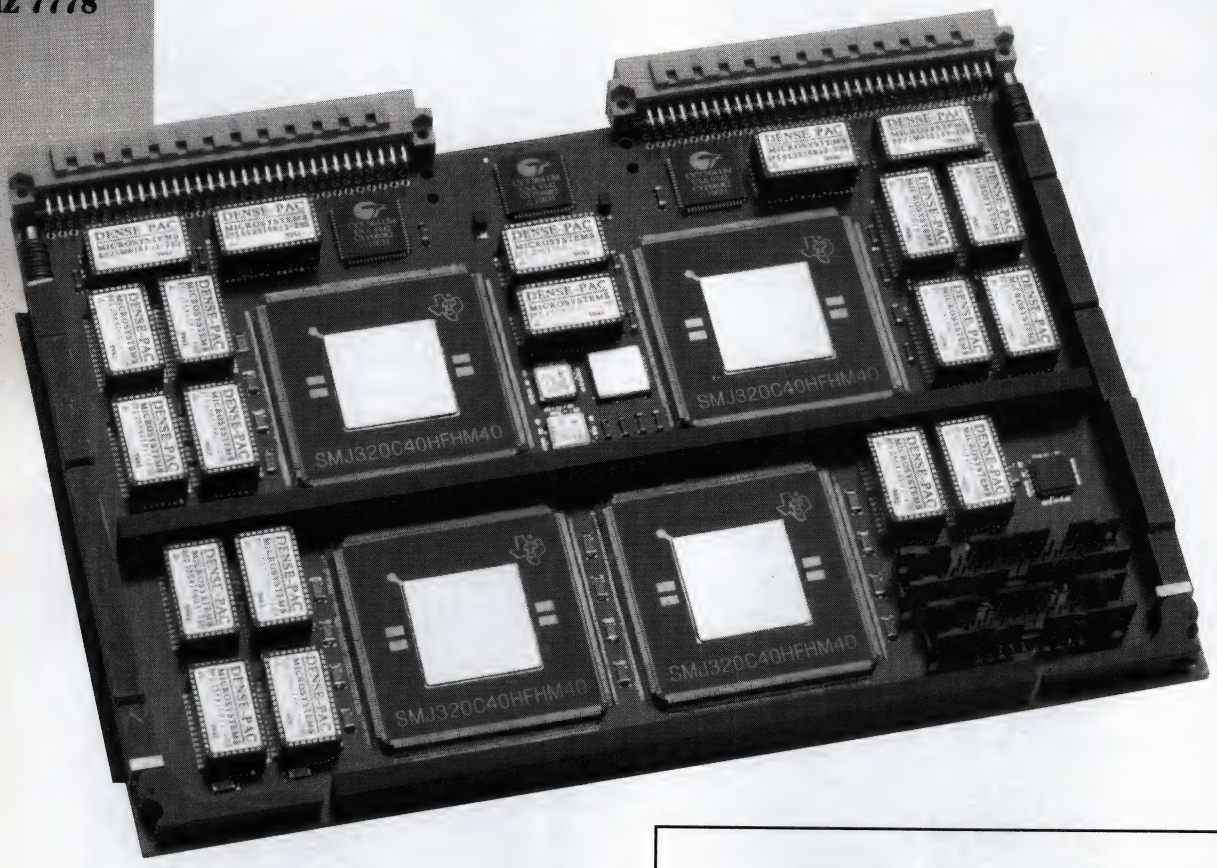
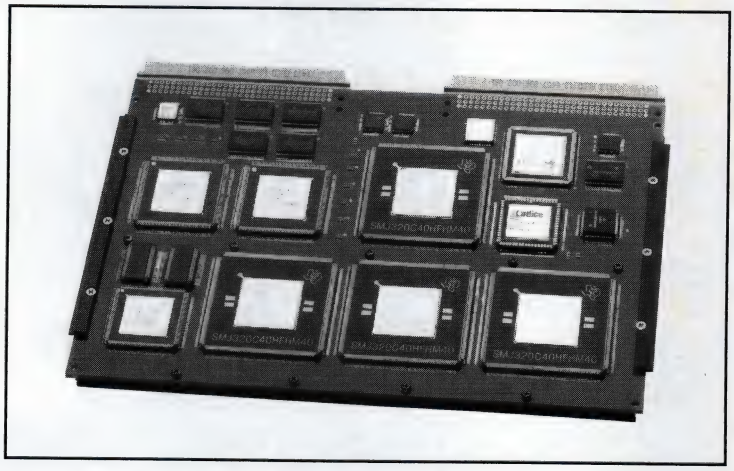
MIZAR in association with TEXAS INSTRUMENTS

Military Specification Octal DSP Engine

MZ 7778

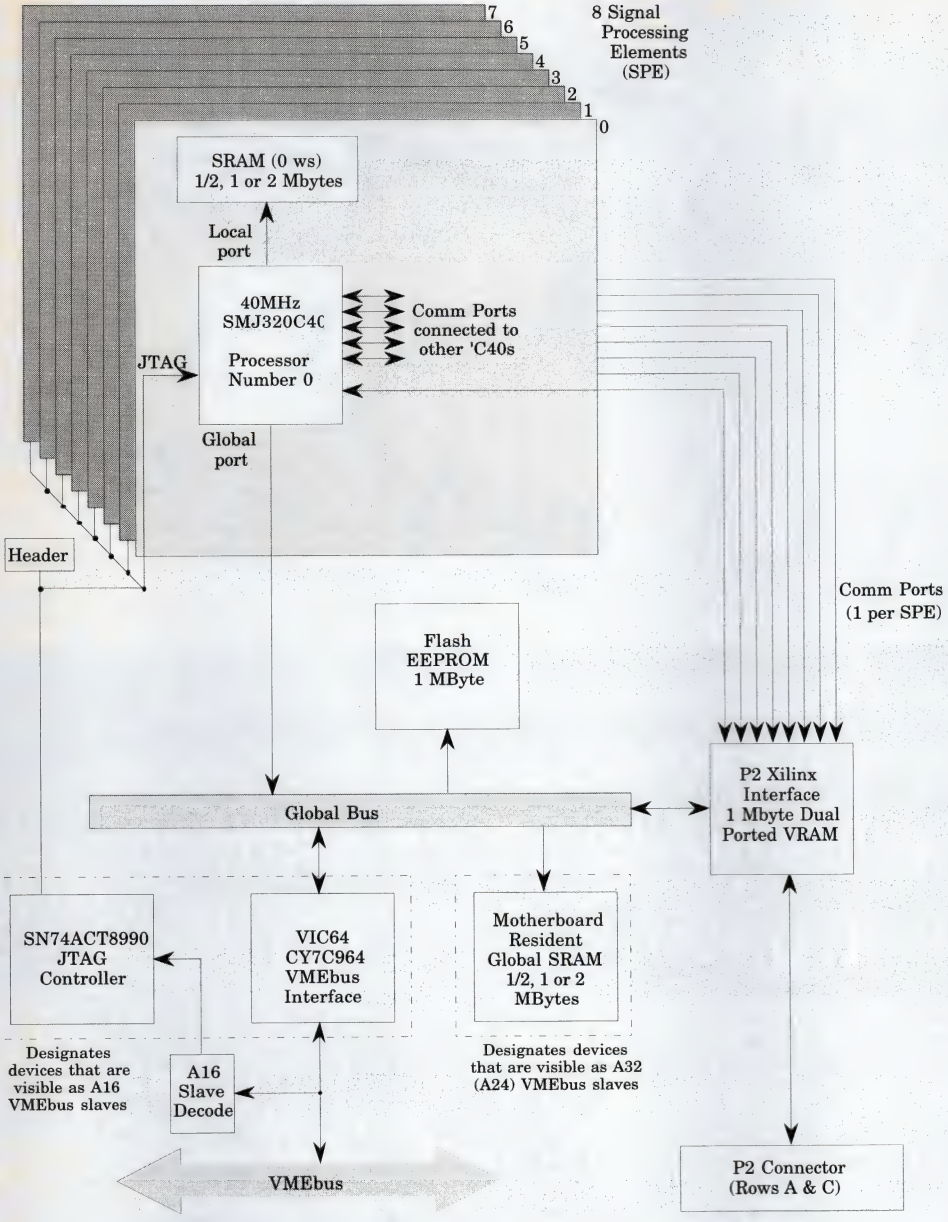




Features

- Eight TI SMJ320C40 digital signal processors in single-slot
- 400 MegaFLOPS
- 2.2 BOPS (billion operations per second)
- Master/slave VMEbus interface with VME64 support
- High-density surface mount polymer-on-polymer PCB with an integral thermal plane
- Up to 18 Mbytes of SRAM on the motherboard
- Up to two Mbytes of Flash EEPROM
- One Mbyte of VRAM accessible globally and via the P2 connector
- Programmable 32-bit Xilinx interface (Xilinx 4010)
- IEEE/JTAG 1149.1 boundary scan controller on-board
- Sun-based Multiuser/Multi-board DSP XDS-510 compatible emulator for C and Ada
- HP/UX development environment available with XDS-510 compatible emulator
- Tartan Ada
- Spectron's SPOX operating system and libraries

TECHNICAL SPECIFICATIONS



Feature Summary

- Eight SMJ320C40 mil-spec DSPs
- Up to 18Mbytes of SRAM
- Up to two Mbytes of Flash EEPROM
- Functionally similar to MZ 7772-8
- Master/slave VME64 interface
- Programmable 32-bit P2 interface (Xilinx 4010)
- IEEE/JTAG 1149.1 boundary scan controller on-board
- Power: 6.4 A (max.) @ 5 VDC; 64mA @ +12 VDC (Flash programming only)
- Mil-spec standards Temperature: Operational: -55 to +85 °C (+72°C cold wall). Non-operational: -55 to +125 °C.
- Random Vibration: 0.02g²/Hz.
- Shock: Operational: 50g. Non-operational: 100g.
- Altitude To 70,000 ft. above sea level.
- Conforms fully with IEEE 1101.2 and 1156.1

Software Options

- 'C40 parallel processor assembler/linker package
- ANSI compatible C compiler with parallel processing runtime library
- C source level debugger with software breakpoints
- Support for PC / Sun / HP/UX
- TI's pDSP XDS 510 in-circuit emulator with JTAG diagnostic support
- Tartan Ada compiler
- TI Network Operating System (NOS)
- SPOX operating system support

The Mizar MZ 7778, which was designed by Texas Instruments, Defense Systems Electronics Group (DSEG) in partnership with Mizar, is a single-slot 6U VMEbus board that delivers 400 MegaFLOPS (million floating point operations per second). By taking advantage of the 'C40's advanced CQFP (ceramic quad flat pack) packaging, Mizar is able to provide this unparalleled logic integration for military and other hazardous applications that require conformance to IEEE 1101.2 and 1156.1.

As standard features, the MZ 7778 has eight 40 MHz SMJ320C40 DSPs each with one Mbyte of zero wait state local SRAM and one Mbyte of global SRAM for a total of nine Mbytes of SRAM per board; one Mbyte of 32-bit wide Flash EEPROM; an A32/A24, D64/D32/D16 VME master/slave interface with optional system controller, one Mbyte of multi-ported video RAM on the global bus; a programmable Xilinx 4010 gate array with access to P2, VRAM and the global bus; five interconnected 20 Mbytes/sec communications ports between the 'C40s (the sixth communications port of each 'C40 is accessible by the Xilinx 4010); and an on-board IEEE/JTAG boundary scan controller.

The massive power of its hardware, and the many software support tools provided by Mizar (including Sun and HP/UX-based emulators) make the MZ 7778 an outstanding platform for DSP applications for years to come.

CIRCLE 30 ON READER SERVICE CARD

Specifications subject to change without notice.

FOR MORE INFORMATION PLEASE CALL

1-800-635-0200

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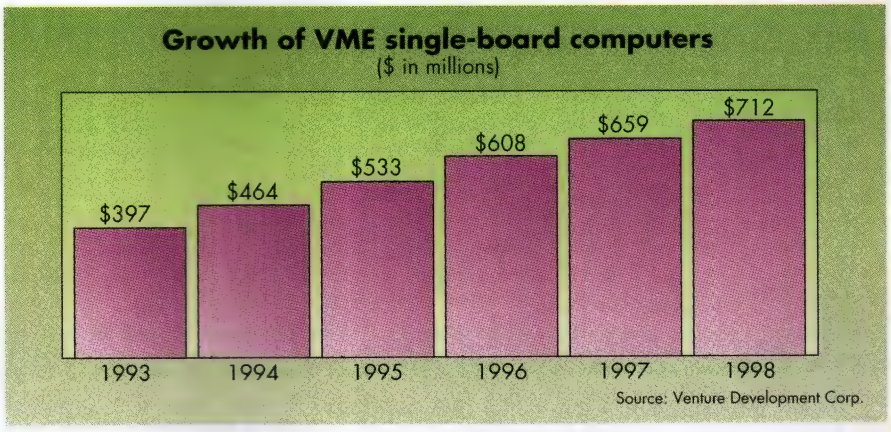
TECHNOLOGY

CIRCLE 14 ON READER SERVICE CARD

Changing times for VME CPU boards

Budget cuts and a mandated shift to open systems are forcing military board customers to adapt their requirements to the new realities.



One of the strongest and most enduring markets in the military and aerospace electronics arena is VME circuit boards, which remain at the heart of most embedded defense applications. The market for off-the-shelf VME boards in military applications is expected to double over the next five years, from $146 million in 1993 to more than $300 million in 1998, says Dan Baker, a consultant for market research firm Venture Development Corp. (Natick, Mass.)

Despite attempted inroads by other board form factors, such as Futurebus+, VME remains overwhelmingly popular with military systems designers because of its utility and large installed base. Baker says a recent poll of the VME industry revealed that of the entire 1993 market of $179 million, 82 percent of the applications were military.

"The military does not seem to be wedded to old technology," Baker says. "And the military is much more receptive to SPARC and RISC processors than is the general market. The military wants the best available, so we expect demand for SPARC and PowerPC processors on VME to be very strong."

Other processors expected to make strong showings in military VME applications over the next five years include the Texas Instruments 320C30 and 320C40, as well as the Motorola 68040, Baker says. Those processors not expected to do well in the military market include the Intel Pentium, 80860, and 80960, he says. "Intel will do its own thing with Multibus II, which doesn't have the range of board products as VME."

Until recently, government and industry officials had been optimistic about the potential for Futurebus+, a 64- and 128-bit backplane data bus and board form factor, to catch on strongly in the military and commercial markets, but so far it has failed to pan out. "Futurebus+ is dead in the water," Baker says. "Other than Raytheon, which has adopted it as the backplane for its SEM-E modules, I don't see any action there. There are no big players."

Baker says Futurebus+ may occupy a niche market through the late 1990s, but nothing close to VME. "It will have pockets of success, but certainly less than a $20 million market in five years." He estimates today's Futurebus+ market at only $4 million.

Demand for VME boards is flourishing as military program managers heed the Defense Department's mandate to standardize on open architectures. To satisfy the DoD, VME manufacturers provide a range of products, from full mil-spec boards for the severest environments to off-the-shelf boards for benign environments. But while VME is the reigning military bus architecture, its future depends more on defense budgets than on the introduction of new products.

"It's really a congressional budget issue," said Bart Mallio, division manager of Venture Development, which tracks the VMEbus market. "If the money stays locked in, it will remain a strong market."

Still, VME board makers are confident their products will be in demand for some time to come. Venture Development's Mallio predicts Futurebus+ is at least five years away and its high cost will contribute to the longevity of VME.

At the core of the military VME business is the ruggedized CPU board. And as a rule, vendors usually develop the most environmentally demanding boards first and then follow up with boards for less severe or benign environments.

One issue that tends to confuse users is the difference between full mil-spec VME CPU boards and the off-the-shelf "rugged" boards sold by commercial vendors. The latter are used in such platforms as mobile systems that do not need to withstand the harshest environments.

Industry watchers see standard commercial boards having some chips replaced where possible with Mil-Std-883 parts or other mil-spec components and then being dubbed "rugged."

VME board manufacturers say the user definitely has to be wary of these approaches. In some cases, this technique can help an engineer if, for example, he or she is trying to achieve a higher mean time between failures calculation. M&AE

VME CPU BOARDS

Model	CPUs	CPU clock speed (MHz)	Math coprocessor	Memory (Mbytes)	Memory speed (ns)	I/O ports (number and type)	On-board interboard expansion	Price
Aeon Systems, Inc., 8401 Washington Place, NE, Albuquerque, NM 87113, (505) 828-9100, fax (505) 823-0110 Circle 427								
VME Alpha 64/SP	Alpha AXP	150	—	10 to 28	—	SCSI, Enet, UART	No	Yes
VME Alpha 64/XP	Alpha AXP	275	—	32 to 512	—	SCSI, Enet, UART	Yes-PMC	Yes
VME 300	rt VAX	20	—	2 to 16	—	Enet, UART, SCSI	No	Yes
Aitech Defense Systems, Inc., 3080 Olcott St., Ste.105A, Santa Clara, CA 95054, (408) 980-6200 Circle 428								
C740	68040	32	Built -in	Up to 6 SRAM or up to 4 SRAM + 4 Flash	1 WS	4xRS-232/422, Ethernet, 1553B	—	Call
C140	68040	25/32	Built-in	Up to 10 SRAM or up to 16 Flash	1 WS	5xRS-232/422, Ethernet	—	From $4,785
C130	68030	32	68882	6	0 WS	5xRS-232/422, Ethernet, 2x1553B	—	From $3,850
C407	68030 + 4x68302	32	4	4	0 WS	14xRS-232/422/485 or 64 opto-isolated discretes	—	Call
Alacron, Inc., 71 Spitbrook Road, Nashua, NH 03060 (603) 891-2750 Circle 429								
AL860-V	(1) L860 XR	25,40	n/a	Up to 272	70	2 serial	VSB	$3500+
FT200-V	(1 or 2) L860XP	50	n/a	Up to 272	60	2 serial	VSB	$9,000+
Ariel Corp., 433 River Road, Highland Park, NJ 08904 (908) 249-2900, fax (908) 249-2123 Circle 430								
Hydra	2 or 4 TMS320C40	40, 50	None required	64 (DRAM), 5 (SRAM), 512 kbytes (EPROM)	70 (DRAM), 20 (SRAM)	12 commport, 2 serial	VSB (optional), ADbus 24-bit parallel bus	$10,495
Hydra II	2 or 4 TMS320C40	40, 50	None required	32 (SRAM), 32 kbytes (dual-port RAM), 128 kbytes (Flash)	20 (SRAM)	16 commport, 1 serial	VSB (optional), 200 Mbytes/sec of local bus I/O	$6,995
CommIO	TMS320C40	32	None required	8 (SRAM), 128 kbytes Flash	25 (SRAM)	4 commport	4 IndustryPack sites	$2,795
Avtec Systems, Inc., 10530 Rosehaven St., Suite 300, Fairfax, VA 22030, (703) 273-2211, fax (703) 273-1313 Circle 431								
FSI02 9U or 6U with transition module	68340	16.77 or 25	n/a	4 Mbytes fast page mode DRAM 70 ns, 128 kbytes EPROM 120 ns	70	2 RS-232, 1 serial telemetry I/O	n/a	From $3,590 - $5,995
Communication Automation & Control Inc., 1642 Union Blvd., Suite 200, Allentown, PA 18103-1510, (800) 367-6735, fax (610) 770-1232 Circle 432								
VME6U6/512K	6 DSP32Cs	50	None required	3 (SRAM)	20	T1; E1; ISDN; 12 audio channels; ASE/EBU audio	4 TDM serial buses	$10,900
VME9U12	12 DSP32Cs	50	Nonereq.	6 (SRAM)	20	Same as above	Same as above	$21,800
Concurrent Computer Corp., Two Crescent Place, Oceanport, NJ 07757, (908) 870-5888, fax (908) 870-3856 Circle 433								
MAXION	MIPS R4400	200	n/a	16, 64, 128	—	Ethernet, SCSI, (differential) 4 RS-232	—	—
CSPI, 40 Linnell Circle, Billerica, MA 01821, (800) 325-3110, fax (508) 663-0150 Circle 434								
SC-4XL	1860 (eight)	40	on-chip	64	50	2 32-bit	VSB,VME64	—
SC-3XL	1860	50	on-chip	64	40	2 32/64-bit	VSB	—
SC-2	1860	40	on-chip	16	50	1	VSB	—

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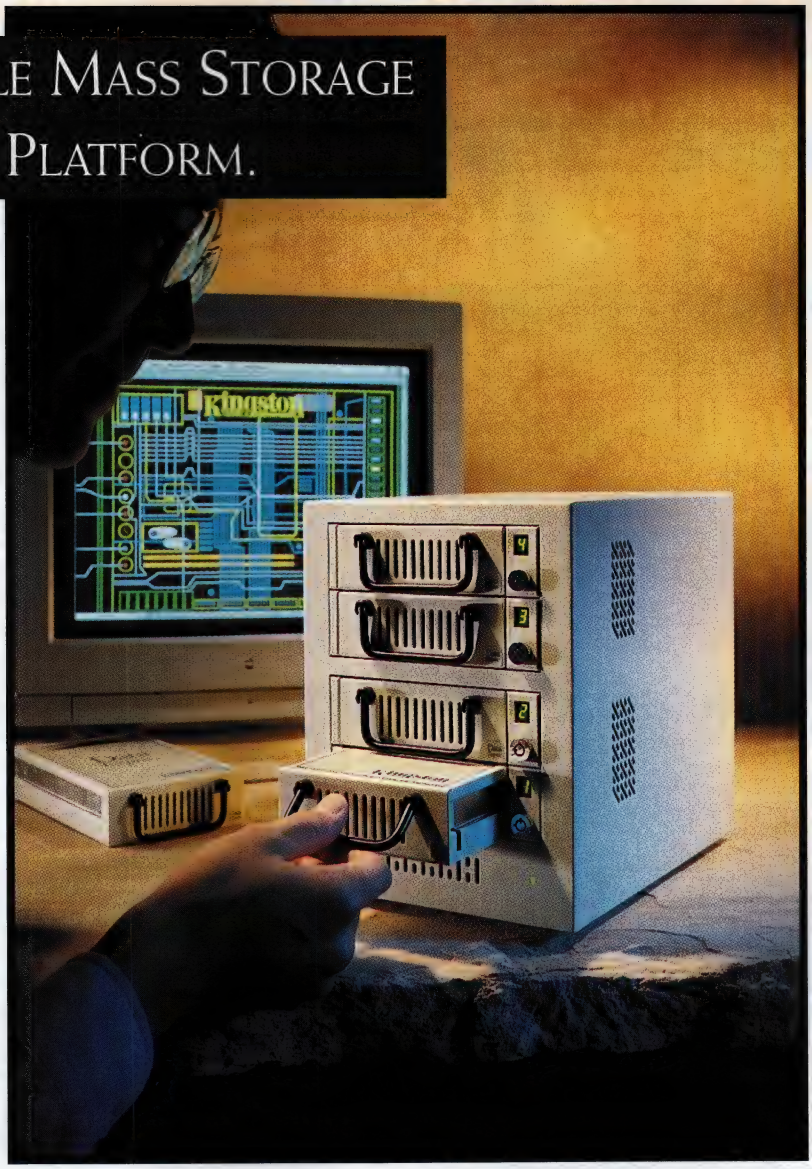

Data Express: Rugged Removability

Data Express, a family of durable removable carriers, houses a hard disk or DAT (Digital Audio Tape) device, adding up to 36GB plus the many benefits of storage removability to your PC or workstation. Data Express is available internally; mounting into your computer system drive bay, or externally; housed in steel enclosures and equipped with a fan and power supply. Data Express boasts an industry leading 25,000 insertions for long lasting removability. Constructed of steel and equipped with superior ventilation, Data Express provides the peripheral cooling needed when using large capacity devices.

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Kingston's Data Silo is a family of stand alone external storage enclosures for half-height or full-height 5.25" or 3.5" SCSI peripherals. Data Silo is available in versions to house one, two, four, or nine SCSI devices simultaneously providing the utmost flexibility for storage expansion, disk array environments, and peripheral integration. Each Data Silo is equipped with its own power supply and fan and constructed of 100% steel, making Data Silo the most durable external storage enclosure available today.

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VME CPU BOARDS

Model	CPUs	CPU clock speed (MHz)	Math coprocessor	Memory (Mbytes)	Memory speed (ns)	I/O ports (number and type)	On-board interboard expansion	Price
DY 4 Systems Ltd., 1475 S. Bascom Ave., Ste. 202, Campbell, CA 95006, (408) 377-9822, fax (408) 377-4725 Circle 435								
DMV-160	68040	25	—	4 Mbyte SRAM, 1 Mbyte Flash EPROM	1WS	2 EIA-423, 1 TTL, 1 VSB/SCSI	No	From $6,469
DMV-162	68040	25/33	—	1 Mbyte to 8 Mbytes SRAM up to 8 Mbytes Flash EPROM	1WS	2 EIA-423, 2 EIA-232/422, 2 1553B, 1 SCSI, 1 Ethernet, 14 bit parallel	MAXPack interface	From $6,935
DMV-163	68040	25/33	—	16/32/64 Mbyte DRAM 4 Mbytes Flash EPROM	3 WS random 5/2/2/2 clocks burst	2 EIA-423, 2 EIA-232/422, 2 1553B, 1 SCSI, 1 Ethernet, 14 bit parallel	MAXPack interface	TBD
DMV-442	QUAD 320C40	40	—	Up to 18	0 WS	4 buffered comm ports	Yes	—
Dynatem, 23455 Madero, Suite B, Mission Viejo, CA 92691, (714) 855-3235, fax (714) 770-3481 Circle 436								
DCPU332	68332	16.67	None	2 Mbyte SRAM	120	1 RS-232, TPU, SCSI	—	$710 (1)
DCOM332	68332	16.67	None	2 Mbyte SRAM	120	3 serial, 16-bit TPU	VLX BUS	$740 (1)
DICB16	68HC00	12	None	256 kbytes	120	16 serial, RS-232/422	—	$1,215 (1)
Force Computers, Inc., 2001 Logic Drive, San Jose, CA 95124, (800) FORCE-99, fax (408) 371-3882 Circle 437								
CPU-486	80486DX/2	32/64	No	8/16/32	70	Standard IBM PC AT	mezzanine for SVGA	$3,995
SPARC-CPU5TE	MicroSPARC-II	85	Yes, incl. w/CPU	8 to 128	60	2 SCSI, 2 Ethernet floppy, parallel, 2 serial, KBD/MSE	2 SBus slots	$6,495
CPU-64	68060	50/66	on-chip	8/16/32/64	60	4 serial 1-16 bit parallel	None	$5,500
IDC-1/2	68360	25	No	4	70	4 or 8 serial 1 Ethernet (option)	Custom, for serial adapters	$1,900/100
SPARC-CPU5V	MicroSPARC-II	110	Yes, incl. w/CPU	8 to 192	60	SCSI, Ethernet, floppy, parallel, 2 serial, keyboard, mouse	2 SBus slots	$7,495
General Micro Systems, Inc., PO Box 3689, 8358 Maple Place, Rancho Cucamonga, CA 91729, (909) 980-4863, fax (909) 987-4863 Circle 438								
GMSV64	SuperSparc, Power PC, I-960	40 to 50	N/A	128	60	Two S-Bus 4 Serial	—	Start $4,995
GMSV49	68040	33	Included	2 to 32	60	8 Serial SCSI, Enet	A24-D32 Exp.Bus	$1,300
GMSV46	68040	33	Included	2 to 32	60	8 Serial SCSI, Enet	A24-D32 Exp.Bus	$1,100
GMSV36	68030	33	Optional	2 to 32	60	8 Serial SCSI, Enet	A24-D32 Exp.Bus	Under $1,000
GMSV17	68030	50	Optional	512	60	Serial, SCSI, Enet, ISDN, 1553, GPIB	2-A32-D32 SAM-Bus	$1,200
Greenspring Computers, Inc., 1204 O'Brien Drive, Menlo Park., CA 94025-1413, (415) 327-1200, fax (415) 327-3808 Circle 439								
SBC 13U	MC68HC000	16	—	512 kbytes or 2 Mbytes	80	2 RS-232D	—	From $425
SBC5 3U	MC68030	32	MC68882 optional	1 Mbyte or 4 Mbytes with 1 Mbyte Flash	60	2 RS-232D	Optional OEM connector	From $1,299
VIPC 75	68030	32	MC68882 optional	1 Mbyte or 4 Mbytes with 1 Mbyte Flash	60	2-RS232 RTC	2-Industry pack sites	From $1,795

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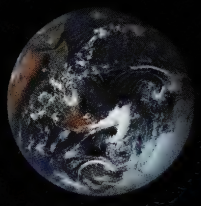

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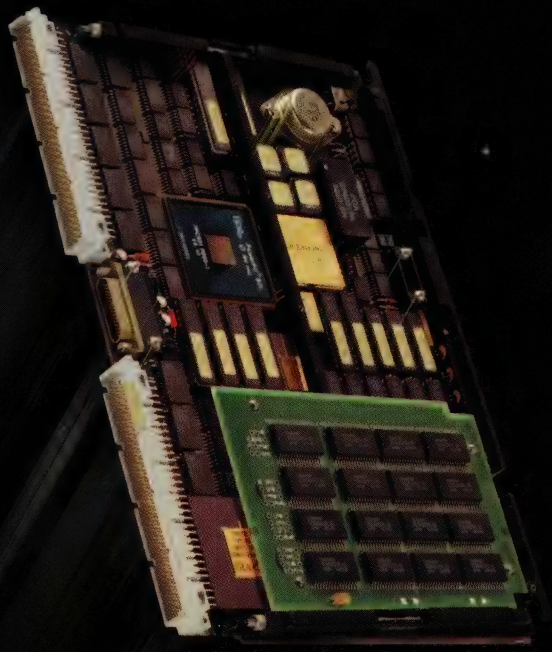

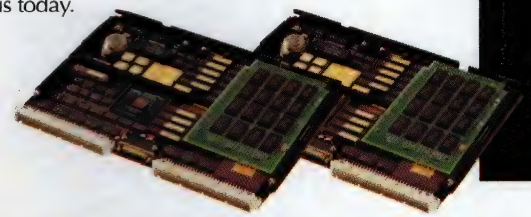

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RADSTONE
TECHNOLOGY

VME CPU BOARDS

Model	CPUs	CPU clock speed (MHz)	Math coprocessor	Memory (Mbytes)	Memory speed (ns)	I/O ports (number and type)	On-board interboard expansion	Price
Heurikon Corp., 8310 Excelsior Drive, Madison, WI 53717, (608) 831-5500, fax (608) 831-4249 Circle 440								
VIPC 64	68020	16	MC68882 optional	1 Mbyte	85	2-RS232 RTC	2-Industry pack sites	From $1,495
HK 68/V4F	68040	33	on-chip	8 or 16	70	2 serial	Corebus	$4,395
Nitro40	68040	33	on-chip	8 or 16	70	2 serial, 1 SCSI, 1 Ethernet	Corebus	$4,995
Nitro60	68060	50	on-chip	8 or 16	70	2 serial, 1 SCSI, 1 Ethernet	Corebus	$5,495
Laguna	R4600	100 or 133	on-chip	16, 32, 64, or 128	70	2 serial, 1 SCSI, 1 Ethernet	n/a	$7,475
Malibu	R3081	40	on-chip	8, 16 or 32	70	2 serial, 1 SCSI, 1 Ethernet	n/a	$4,995
Ixthos, Inc., 12210 Plum Orchard Drive, Silver Spring, MD 20904-7801, (301) 572-6700, fax (301) 572-6705 Circle 441								
IXD7232	Analog Devices 2 ADSP-21020's	25/33	Built-in	3/16	15/70	2 RS-232, 2 IXI mezzanine ports	Mezzanine board	Starts at $9,950
IXZ4xxx	Analog Devices 4 ADSP-2106x's	33/40	Built-in	2/256	10/60	2 IXI mezzanine ports, 12 off board links, P2 interface	Mezzanine board, links, P2	Starts at $14,500
IXZ8xxx	Analog Devices 8 ADSP-2106x's	33/40	Built-in	2/256	10/60	16 off board links, P2 interface	Mezzanine board, links, P2	Starts at $25,000
Logical Design Group, 6301 Chapel Hill Rd., Raleigh, NC 27607 (919) 851-1101, fax (919) 851-2844 Circle 442								
VME-XPX	80386DX-80486DX2	25, 33, 50	Yes	4, 16	80	2 serial, 1 parallel, 1 keyboard	Yes	—
VME-1486	80486SX-80486DX2	25, 33, 50, 66	Yes	4, 16	80	2 serial, 1 parallel, 1 keyboard	Yes	—
VME-2486	80486DX-80486DX4	25, 33, 66	Yes	4, 8, 16 or 32	80	2 serial, 1 parallel, 1 keyboard	Yes	—
VME-3486	80486DX-80486DX4	25, 33, 66	Yes	4, 8, 16 or 32	80	2 serial, 1 parallel, 1 keyboard	Yes	—
VME-8486	80486DX-80486DX4	33, 66, 100	Yes	4, 8, 16 or 32	80	2 serial, 1 parallel, 1 keyboard	Yes	—
Loral Rolm Computer Systems, 3151 Zanker Road, San Jose, CA 95134, (408) 432-8000, fax (408) 432-7961 Circle 443								
Digital XPRESS DXP4	4 x i860	40	None	16 to 64 (DRAM)	50 (page mode)	1 @ 160 Mbytes/s	XPRESSway backplane crossbar; 1,280 Mbytes/s max.	Contact Loral
Digital XPRESS DXP8	8 x i860	40	None	32 to 128 (DRAM)	50 (page mode)	2 @ 160 Mbytes/s	XPRESSway backplane crossbar; 2,560 Mbytes/s max.	Contact Loral

VME CPU BOARDS

Model	CPUs	CPU clock speed (MHz)	Math coprocessor	Memory (Mbytes)	Memory speed (ns)	I/O ports (number and type)	On-board interboard expansion	Price
Matrix Corporation, 1203 New Hope Rd., Raleigh, NC 27610, (800) 848-2330, fax (919) 231-8001 Circle 444								
MR-CPU540	MC68040	25	Built-in	40 Mbytes DRAM, 16 Mbytes Flash EPROM	60	16 Serial, 2 Parallel, 2 LAN	—	Call for latest
MR-CPU440	68040	32	Built-in	32 Mbytes DRAM, 2 Mbytes Flash EPROM	80	5 Serial, 1 Parallel	—	$6,370
MR-CPU360	68360	25	—	32 Mbytes DRAM, 2 Mbytes SRAM, 4 Mbytes Flash	60	5 Serial, 1 LAN, 1 Parallel	—	$1,350
MR-CPU330	MC68030	25	MC68882	8 Mbytes DRAM, 32 kbytes SRAM, 1 Mbyte EPROM	80	2 Serial	Dbus-68, serial, parallel, Ethernet, SCSI, floppy	Call for latest
MX-CPU320	MC68020	25	MC68882	8 Mbytes DRAM, 128 kbytes SRAM, 1 Mbyte EPROM	80	2 Serial, 1 Parallel	Dbus-68, serial, parallel, Ethernet, SCSI, floppy	Call for latest
MR-CPU302	68302	20	—	4 Mbytes DRAM, 1 Mbyte SRAM, 2 Mbytes Flash	70	3 Opto-isolated serial, 1 Parallel	—	$2,375
MSX-CPU220	MC68020	116	MC68882	4 Mbytes DRAM, 2 Mbytes EPROM	80	2 Serial, 1 Parallel	Dbus-68, serial, parallel, Ethernet, SCSI, floppy	Call for latest
MD-CPUE100	MC68HC000	12.5	—	4 Mbytes DRAM, 1 Mbyte SRAM, 2 Mbytes EPROM	80	4 Serial	232, 422, 485, Multidrop	Call for latest
MX-CPU100	MC68000	12.5	—	1 Mbyte DRAM, 8 kbytes SRAM, 128 Mbytes EPROM	80	2 Serial	232, 422, 485, Multidrop	Call for latest
MSX-CPU02	MC68000	10	—	256 kbytes SRAM, 1 Mbyte EPROM	100	2 Serial	N/A	Call for latest
Mercury Computer Systems, Inc., 199 Riverneck Road, Chelmsford, MA 01824-2820, (508) 256-1300 Circle 445								
RACE MCV6	Up to 4 i860s	40	No	2 to 64 per i860	50	1 32-bit TTL Parallel (optional)	Raceway via P2	Starts at $30,200 with 4 processors
RACE MCV9	Up to 16 i860s	40	No	2 to 64 per i860	50	2 32-bit TTL Parallel (optional)	Raceway via P2	Starts at $108,800 with 16 processors
Micro Industries, 8399 Green Meadows Dr. N., Westerville, OH 43081-9486, (614) 548-7878 Circle 446								
PG960CA	80960	33	No	4	—	VME bus	—	$3,450
PG2004	68000	10	No	—	—	VME	No	$995
Mizar, Inc., 2410 Luna Road, Carrollton, TX 75006, (800) 635-0200, fax (214) 277-4666 Circle 447								
MZ 7770	Quad 320C40	40/50	n/a	Up to 10 SRAM	Zero wait state	12 comm ports (8-bit), two serial and JTAG	VSB	$11,170
MZ 7775	Quad 320C40	40	n/a	Up to 10 SRAM	Zero wait state	4 comm ports (8-bit), one serial and JTAG	VSB	$25,705
MZ 7772	Quad 320C40	50	n/a	Up to 36 SRAM	Zero wait state	16 comm ports (8-bit), JTAG	Optional VSB, optional I/O	$22,400
MZ 7140	68040	25	Yes	32	80	Serial, parallel, SCSI, Ethernet	—	$3,495

VME CPU BOARDS

Model	CPUs	CPU clock speed (MHz)	Math coprocessor	Memory (Mbytes)	Memory speed (ns)	I/O ports (number and type)	On-board interboard expansion	Price
Mizar, Inc., 2410 Luna Road, Carrollton, TX 75006, (800) 635-0200, fax (214) 277-4666 Circle 447 *(continued)*								
MZ 7772-4	Quad 320C40	40/50	n/a	Up to 10 SRAM	Zero wait state	12 front panel comm ports, JTAG	Optional I/O	$9,375
MZ 778	Octal 320C40	40	n/a	Up to 18 SRAM	Zero wait state	48 interconnected comm ports, JTAG	N/A	TBD
MZ 4700	Dual 320C40	40/50	n/a	16 Mbytes DRAM; 16 Mbytes DRAM; 2 Mbytes triple-ported DRAM; 1/2 Mbytes SRAM	Zero wait state	2 Industry Paks, 2 160 MB/sec I/O ports	Raceway daughter-boards	TBD
Motorola Computer Group, 2900 South Diablo Way, Tempe, AZ 85282, (602) 441-5268, fax (602) 441-3868 Circle 448								
MVME133	68020	12.5 to 20	68882	1	70	3 SIO	No	—
MVME133XT	68020	25	68882	4	70	3 SIO	No	—
MVME143	68030	16 or 25	68882	4	70	3 SIO	No	—
MVME147	68030	16.67 to 32	68882	4 to 32	70	4 SIO; 1 PIO; SCSI-2; Ethernet	No	—
MVME162	68040	25	In MPU	1 to 8	70	2 SIO; SCSI-2; Ethernet	IndustryPack	—
MVME162LX	68040	25	In MPU	1 to 32	70	4 SIO; SCSI-2; Ethernet	IndustryPack	—
MVME166	68040	33	In MPU	4 to 256	70	4 SIO; 1 PIO; SCSI-2; Ethernet	VSB	—
MVME167	68040	25 to 33	In MPU	4 to 256	70	Same as above	No	—
MVME177	68060	33	In MPU	4 to 256	70	Same as above	No	—
MVME187	88100	25 to 33	In MPU	4 to 256	70	Same as above	No	—
MVME197	88100	50	In MPU	32 to 512	70	Same as above	No	—
MVME1603	MPC603	66	In MPU	8 to 128	70	4 SIO; 1 PIO; SCSI-2; Ethernet, SVGA	PMC	—
MVME1604	MPC604	100	In MPU	8 to 128	70	Same as above	PMC	—
or Industrial Computers, 23455 Madero, Suite B, Mission Viejo, CA 92691, (714) 855-3235, fax (714) 770-3481 Circle 449								
VCPU40	68040	66	FPU inside	32 Mbytes DRAM, Flash EPROM	—	1 RS-232, 2 232/485	—	$2,434
VCPU30	VCPU30	50	68882	8 Mbytes DRAM, SRAM, PROM	—	1 RS-232, 1 232/485	VLX bus	$1,482 (1)
VC302	VC302	16.00	None	4 Mbytes DRAM, Flash	—	2 RS-232, 4 232/4XX	—	$1,136 (1)
VC486	486SLC	Up to 50	None	16 Mbytes DRAM, Flash/PROM, SRAM	—	All PC System, I/O	ISA, PC/104, VESA	$1,176 (1)
RUGG-PC	486-Pentium	Up to 100	Built-in	64 Mbytes DRAM, Flash, EE, SRAM	—	All PC based I/O, SCSI, Ether	PC/104	Call for price
V360	68360	25	None	32 Mbytes DRAM, Flash, SRAM	—	6 Serial, Parallel, SCSI, Ethernet	—	$1,316

VME CPU BOARDS

Model	CPUs	CPU clock speed (MHz)	Math coprocessor	Memory (Mbytes)	Memory speed (ns)	I/O ports (number and type)	On-board interboard expansion	Price
Pentek, Inc., 55 Walnut St., Norwood, NJ 07648, (201) 767-7100 , fax (201) 767-3994 Circle 450								
4285	OCTAL TMS320C40	50	—	16 SRAM	20	'C40 comm ports 8 ports x 8 bits	MIX or PMC mezzanine buses 32-bit I/O	$19,995
4270	QUAD TMS320C40	40/50	—	8 SRAM	20	'C40 comm ports 12 ports x 8 bits	MIX expansion bus for I/O-32-bits	$11,995
4269	DUAL TMS320C40	40/50	—	4 SRAM	20	'C40 comm ports 10 ports x 8 bits	MIX expansion bus for I/O-32 bits	$6,995
4284	TMS320C40	40/50	—	16 DRAM/4 SRAM	50/20	'C40 comm ports 6 ports x 8 bits	MIX expansion bus for I/O-32 bits	$6,450
4283	TMS320C30	32/40	—	4 DRAM/.25 SRAM	50/25	Serial TTL 2 @ 8 MHz	MIX expansion bus for I/O-32 bits	$4,995
4200/4201	68030	16/32/40	—	4 SRAM	25	RS-232C 2 @ 9600 baud	MIX expansion bus for I/O-32 bits	$2,495/ $1,995
PEP Modular Computers, 5010 E. Shea Blvd., Ste. C-226, Scottsdale, AZ 85254, (602) 483-7100 Circle 451								
VM45	68040	25	Embedded	Up to 32-Mbytes DRAM; 2-Mbytes dual-ported SRAM, 1-Mbyte EPROM	60	2 RS-285/232/422, 1 SCSI, 1 Ethernet	LXB 96-pin	$4,125
VM40	68040	25	Embedded	Up to 32-Mbytes DRAM, 1-Mbyte EPROM	60	2 RS-485/232/422	None	$2,571
Performance Computer, 315 Science Pkwy., Rochester, NY 14620, (716) 256-0200, fax (716) 256-0791 Circle 452								
141	68030	25	Optional	Up to 8 Mbytes	80	Up to 8 synch, up to 16 asynch	Yes	$1,995
151A	68040	25	Optional	Up to 64 Mbytes	80	Up to 8 synch, up to 16 asynch	Yes	$2,595
161	68060	50	Optional	Up to 64 Mbytes	80	Up to 16	Yes	$3,995
Pulse Embedded Computer Systems, Inc., 12320 Washington Ave., Rockville, MD 20852, (301) 881-7000 Circle 453								
SBC2 with 1553 bus	MC 68020	16 or 24	MC 68882	2-Mbytes SRAM, 1-Mbyte EPROM	45	1553 bi-dual redundant, 4 RS-232 or 2 RS-232/422	No	$3,280
SBCIO with 8 serial ports	MC 68020	16 or 24	MC 68882	2-Mbytes SRAM, 1-Mbyte EPROM	45	8 RS-232 or 4 RS-232 and 4 RS-422	No	$3,280
Radisys Corp., 15025 S.W. Koll Pkwy., Beaverton, OR 97006-6902, (503) 646-1800 Circle 454								
EPC-5	80486	25,33,66	On-chip	4, 8, 16 or 32 Mbytes of dual-ported DRAM	80	4	Yes	$4,795
EPC-4	80386DX	25	Optional 80387DX	4, 8, or 16 Mbytes dual-ported DRAM 1, 2, 4 Mbytes	80	4	Yes	$3,595
Radstone Technology, 50 Craig Rd., Montvale, NJ 07645-1709, (201) 391-2700, fax (201) 391-2899 Circle 455								
CPU-601	PowerPC 601	66	on-chip	16 -64 Mbytes DRAM, 1 -4 Mbytes Flash EPROM, 128 Kbytes EEPROM	70	VME64, VSB, 1 SCSI II, 1 Ethernet, 2 RS423 serial ports	VSB, SCSI, Ethernet	Starts at $6,000

VME CPU BOARDS

Model	CPUs	CPU clock speed (MHz)	Math coprocessor	Memory (Mbytes)	Memory speed (ns)	I/O ports (number and type)	On-board interboard expansion	Price
Radstone Technology, 50 Craig Rd., Montvale, NJ 07645-1709, (201) 391-2700, fax (201) 391-2899 Circle 455 *(continued)*								
CPU-646	68060	33	on-chip	16 -64 Mbytes DRAM, 1 -4 Mbytes Flash EPROM, 128 Kbytes EEPROM	70	VME64, VSB, 1 SCSI II, 1 1553B, 1 Ethernet, 2 RS423, 2 RS422, MXbus	VSB, SCSI, Ethernet, MXbus mezzanine	Starts at $5,125
CPU-44	68040	25	on-chip	4 -8 Mbytes DRAM, 1 -4 Mbytes Flash EPROM, 128 Kbytes EEPROM	45	VME64, VSB, 1 SCSI II, 1 1553B, 1 Ethernet, 2 RS423, 2 RS422, MXbus	VSB, SCSI, Ethernet, MXbus mezzanine	Starts at $8,820
68-64	68060, 68360	50, 66	on-chip	4, 16, 32 Mbytes DRAM, 512 kbytes - 2 Mbytes Flash, 512 kbytes -2 Mbytes SRAM	70	VME64, VSB, 1 SCSI, 1 Ethernet, 7 RS232 /422 /485	VSB, SCSI, Ethernet, MXbus	Starts at $3,895
68-44	68040, 68360	25, 33	on-chip	4, 16, 32 Mbytes DRAM, 512 kbytes - 2 Mbytes Flash, 512 kbytes -2 Mbytes SRAM	70	VME64, VSB, 1 SCSI, 1 Ethernet, 7 RS232 /422 /485	VSB, SCSI, Ethernet, MXbus	Starts at $2,595
68-41/42	68040, 68020	40, 20	on-chip	16 -36 Mbytes DRAM, 1 -4 Mbytes EPROM	80	VME64, VSB, 1 SCSI, 1 Ethernet, 7 RS232 /422 /485	VSB, SCSI, Ethernet, APEX bus	Starts at $3,495
RISQ Modular Systems, Inc., 39899 Balentine Dr., Newark, CA 94560, (510) 490-0732 Circle 456								
RISQ engine/5e	R3052/R3081 with on-chip caches	25, 33, 40	On-chip in R3081 option	2, 8, 16, 32 (2-way interleaved DRAM)	25 ns access time at 40-MHz in burst mode	1 SCSI, 1 Ethernet, 2 serial, 1 parallel	Yes, via 160 Mbytes/s RISCbus	Under $3,000
RISQ engine/6e	R3052/R3081 with on-chip caches	25, 33, 40	On-chip in R3081 option	8, 16 (2-way interleaved DRAM)	Same as above	1 SCSI, 1 Ethernet, 2 serial, 1 parallel	Same as above	Under $3,600
Sabtech Industries, Corporate Office, 5411 E. La Palma Avenue, Anaheim, Ca 92807, (714) 693-3500, fax (714) 970-5377 Circle 457								
FALCON FA-0X101-00	MC68340	16	None	124	80	1 NTDS 2 RS-232	None	$4,995
HAWKE HK-01101-00	MC68020	16	None	512 Kbytes	80	1 NTDS 2 RS-232	None	$4,295
C-HAWKE HK-02101-00	MC68020	16	None	512 Kbytes	80	1 NTDS 2 RS-232	None	$4,295
NATO-HAWKE NH-07101-00	MC68020	16	None	512 Kbytes	80	1 NTDS 2 RS-232	None	$4,931
SERIAL-HAWKE HK-0X101-00	MC68020	20	None	512 Kbytes	80	1 NTDS 2 RS-232	None	$4,495
SKY Computers, Inc., 27 Industrial Ave., Chelmsford, MA 01824, (508) 250-1920, fax (508) 250-0036 Circle 458								
SKYbolt I 6U	1-4 i860s	40	—	64	70	1 SKYburst 40 Mbyte/s	VME32, VSB, SKYburst	Starts at $10,000
SKYbolt I 9U	1-16 i860s	40	—	256	70	1 SKYburst 40 Mbyte/s	VME32, VSB, SKYburst	Starts at $10,000
SKYbolt II	1-4 i860s	40	—	64	70	1 SKYburst 40-160 Mbyte/s	VME64, VSB, SKYchannel, SKYburst	Starts at $10,000
6USKYbolt II 9U	1-16 i860s	40	—	256	70	13 SKYburst 40-160 Mbyte/s	VME64, VSB, SKYchannel, SKYburst	—

VME CPU BOARDS

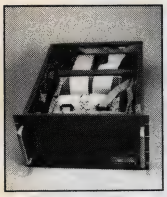
Model	CPUs	CPU clock speed (MHz)	Math coprocessor	Memory (Mbytes)	Memory speed (ns)	I/O ports (number and type)	On-board interboard expansion	Price
Tadpole Technology, 12012 Technology Blvd., Austin, TX 78727, (800) 232-6656 Circle 459								
TP912	microSPARC II	70/85	on-chip	128	60	4 serial, one each of floppy, audio, SCSI, Ethernet, and parallel	Support for 4 SBUS cards	$2,995
TP91	microSPARC	50	on-chip	128	60	4 serial, one each of floppy, audio, SCSI, Ethernet, and parallel	Support for 4 SBUS cards	$1,995
Tasco Electronics, Inc., 80 Express St., Plainview, NY 11803, (516) 938-6464, fax (516) 938-4141 Circle 460								
TVME/1750AP	PACE 1750A/AE	20, 30, 40	—	Up to 2 Mbytes dual ported	70	2 RS232 or RS422	—	Starts at $14,175
TVME/1750APM	PACE 1750A/AE	20, 30, 40	—	Up to 2 Mbytes dual ported	70	2 RS232 or RS422	—	Starts at $21,300
TVME/1750AD	MAS281	20	—	Up to 2 Mbytes dual ported	70	2 RS232 or RS422	—	Starts at $13,075
Themis Computer, 3185 Laurelview Court, Freemont, CA 94538, (510) 252-0870, fax (510) 490-5529 Circle 461								
SPARC LXE	microSPARC	40	on-chip	8 to 96	70	2 serial, 1 parallel, keyboard/mouse	SBus	$3,495
SPARC LXE/Plus	microSPARC	50	on-chip	8 to 96	70	2 serial, 1 parallel, keyboard/mouse	SBus	$3,995
SPARC 5/64	microSPARC II	85 to 100	on-chip	8 to 96	70	2 serial, 1 parallel, keyboard/mouse	SBus	$4,995
SPARC 10MP	superSPARC or hyperSPARC	60 (superSPARC) or 80 (hyperSPARC)	on-chip	32 to 256	70	2 RS232, 1 RS422, keyboard/mouse	2 SBus slots	$9,995
SPARC 10MP/3S	superSPARC or hyperSPARC	60 (superSPARC) or 1000 (hyperSPARC)	on-chip	32 to 512	70	2 RS232, 1 RS422, keyboard/mouse	3 SBus slots	$9,995
Titan Electronics, 3033 Science Pk. Rd., San Diego, CA 92121 (619) 552-9500, fax (619) 552-9668 Circle 462								
SECS 68/130	68030	20	68882	EPROM, EEPROM, up to 2 Mbytes flash, up to 1 Mbyte SRAM	Varies	2 serial, RS232/RS-232-RS422	VSB interface	$14,100
SECS 68/RISC	80960MX	25	MMU, FPP	EPROM, up to 2 Mbytes; dual-ported SRAM, up to 2 Mbytes cache	Varies	2 serial ports, RS-232	VSB interface	$20,000
Tronix Product Development, 4908 E. McDowell Rd., Ste. 100, Phoenix, AZ 85008-4228, (800) 4TRONIX Circle 463								
VME960MX-SBC	i960MX	25	n/a	Backside bus: 1-3 Mbytes, Local bus: 1/2 Mbyte SRAM and 4 Mbytes DRAM	25	2 RS-232C serial interface, Ethernet, parallel port, Mil-Std-1553B	Versatile I/O adapter, local bus expansion via P2	$15,800 (1)
VME960MC-SBC	i960MC	25	n/a		25	2 RS-232C serial interface, Ethernet, parallel port, Mil-Std-1553B	Versatile I/O adapter, local bus expansion via P2	$9,800 (1)

VME CPU BOARDS

Model	CPUs	CPU clock speed (MHz)	Math coprocessor	Memory (Mbytes)	Memory speed (ns)	I/O ports (number and type)	On-board interboard expansion	Price
Visicom/Antares Group, 10052 Mesa Ridge Court, San Diego, CA 92121, (619) 457-2111 Circle 464								
4001 series	AMD 2901	10	n/a	0	n/a	NTDS, A/B/C/D/H/E/F	Mezzanine board	$2,250 (A/B) (100)
4002 series	AMD 2901	10	n/a	1	100	NTDS, A/B/C/D/H/E/F	Mezzanine board	$2,700 (A/B) (100)
4009/10/11	AMD 2901	10	n/a	0	n/a	NTDS, A/B/C/D/H/E/F	VSB	$2,930 (A/B) (100)
Vista Controls Corp., 27825 Fremont Ct., Valencia, CA 91355, (805) 257-4430, fax (805) 257-4782 Circle 465								
SCOREtarget	Am29050 RISC	25	built-in	6	80	2 RS232, 2 programmable TTL	Proprietary HSI: up to 1 additional daughter	$8,900
SCOREboard	Am29000	20	optional	2	80	1 RS232, 2 programmable TTL	Proprietary HSI: up to 2 additional daughters	$3,900 (commercial), $13,900 (mil-spec)
SCORE060	Motorola 68040/68060	50	built-in	8	70	2 RS232, 1 SCSI, 1 Ethernet, Optional Mil-1553	COREbus	$13,900 (rugged), $4,995 (LAB), $14,900 (mil-spec)
VMIC, 12090 South Memorial Pkwy., Hunstville, AL 35803, (205) 880-0444, fax (205) 882-0859 Circle 466								
VMIVME-7486	80486 SX, DX, DX2	25, 33, 66	No (SX), Yes (DX, DX2)	1, 4, 8, 16	70	2 RS232 serial, 1 SVGA, 1 parallel, 1 keyboard	VMEbus master/slave interface, on-board mezzanine expansion site	$1,695 +
VMIVME-7487	80486 SX, DX, DX2	25, 33, 66	No (SX), Yes (DX, DX2)	1, 4, 8, 16	70	2 RS232 serial, 1 SVGA, 1 parallel, 1 keyboard	VMEbus master/slave interface, on-board mezzanine expansion site	$2,315 +
VMIVME-7489	80486 SX, DX, DX2, DX4, Pentium P24T	25, 33, 66, 100	No (SX), Yes (DX, DX2, DX4, P247)	4, 8, 16, 32	70	2 RS232 serial, 1 SVGA, 1 parallel, 1 keyboard	VMEbus master/slave interface, PC/104 expansion site	$2,262 +
Xycom, Inc., 750 N. Maple, Saline, MI 48176, (800) AT-Xycom, fax (313) 429-1010 Circle 467								
XVME-674	486DX or DX2	33 (DX) or 66 (DX2)	internal	4, 16, or 32	60	1 keyboard, 1 mouse, 2 serial, 1 parallel, 1 SVGA, IDE and floppy	PC/104	—
XVME-677	486SX	33	n/a	4, 16, or 32	60	Same as above	PC/104	—
XVME-678	486SLC/e	25	80387SX	0, 1, 4, or 16	60	Same as above	PC/104	—
XVME-688	80386SX	25	80387SX	0, 1, 4, or 16	60	2 serial, 1 keyboard, 1 parallel, 1 SVGA	PC/104	—
XVME-675	Intel DX4	100		16 or 32	60	1 keyboard, 1 mouse, 2 serial, 1 parallel, 1 SVGA	PC/104	—

PRODUCT & LITERATURE SHOWCASE VME CPU BOARDS

C & R Systems, an engineering designer and manufacturer of electronic enclosures and card cages



The enclosures vary in size from 19" rackmounts to ATRs to table top and includes all cooling, wiring, power, motherboard, and I/O). Enclosures and card cages are designed for VME, MBI, MBII, VXI, and PC bus structures. Customers may choose from COTS and hundreds of commercial and industrial and military designed enclosures as well as commercial card cages. C & R can also design peculiar enclosures and card cages to satisfy customer requirements. ISO-9000 requirements are being implemented and currently approved to MIL-I-45208A.

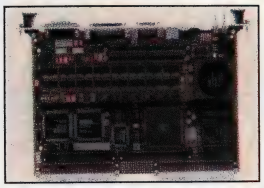
C & R Systems
21 Standen Dr., Hamilton, OH 45015
Phone (513) 860-1544 FAX (513) 860-1556

CIRCLE 17

Vista Controls supplies COTS high performance VME board-level and systems solutions that have been implemented in Fire Control, Stabilization, Weapons Computers, Systems Ballistic Computers, Weapon Autoloaders and Robotic Mechanisms. This full color brochure illustrates Vista's SCOREseries of mil-spec and rugged products, from the SCOREstab, a two axis stabilization RISC-based single board computer, to the Quad 1553 and Mil Std FDDI. Call (805) 257-4430 for your free copy.

CIRCLE 18

CPU-5V Offers Highest SPARC VME Bandwidth



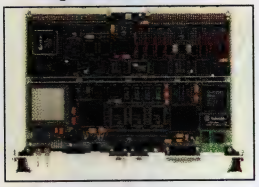
The SPARC CPU-5V, a new 110 Mhz microSPARC-II CPU offers the maximum VME64 bandwidth for demanding embedded applications. It incorporates FORCE's latest ASIC, the FGA-5000, providing a direct Sbus to VME64 interface with transfer rates over 40 MBytes/second. The SPARC CPU-5V combines 100% SPARCstation 5 compatibility with the latest VME64 technology in a compact 6U form factor. Over 9,500 off-the-shelf SPARCware applications are available.

For more information about the SPARC CPU-5V contact:

FORCE COMPUTERS Inc.
2001 Logic Drive, San Jose, CA 95124
Phone: 800-FORCE-99 (800-367-2399)
FAX: (408) 371-3382

CIRCLE 19

New 68060 Based VME Single Board Computer



The CPU-64 is a new VME single board computer optimized for performance. Incorporating the latest 68060 microprocessor, the CPU-64 delivers 2-3 times higher performance over previous models while maintaining application code compatibility. Now, you can protect your software investment while moving to a higher performance platform. It also includes up to 32 Mbytes shared DRAM, VME64, a DMA controller, SCSI-II, and Ethernet, all in a compact 6U VME form factor.

For more information about the CPU-64 contact:

FORCE COMPUTERS Inc.
2001 Logic Drive, San Jose, CA 95124
Phone: 800-FORCE-99 (800-367-2399)
FAX: (408) 371-3382

CIRCLE 20

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CIRCLE 21

PRODUCT & LITERATURE SHOWCASE MIL-SPEC & FAST SRAMS

AUSTIN SEMICONDUCTOR, INC

Austin Semiconductor, Inc., a leading supplier of high reliability memory products and custom semiconductors provides the system designer with a full complement of Hi-Rel products processed to class S, B and custom flows. New Mil and Hi-Rel products for 1995 include:

4 Meg SRAM 3.3v, 5v 20/25/35ns in 32 & 36 pin pkg's (LCC, FPAK, SOJ, DIP)

16 Meg DRAM 3.3v, 5v X4, X8, X16 in all pkg's

Fast 256K and 1M SRAMS (12ns and 15ns)

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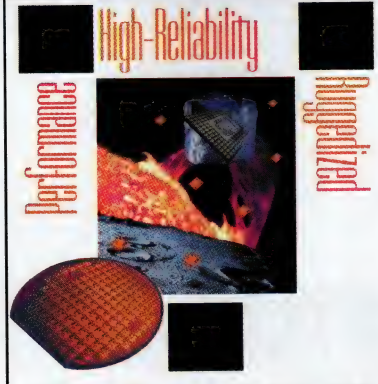

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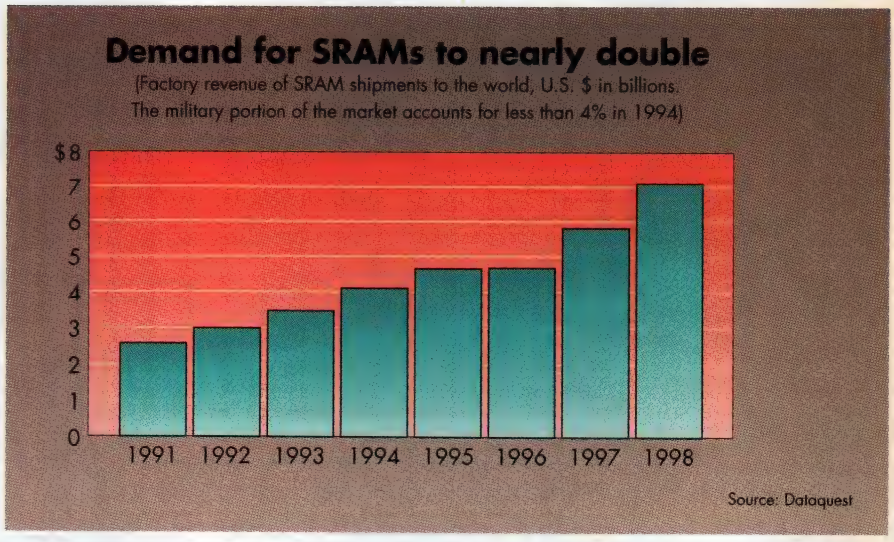
CIRCLE 24

Fast SRAMs keep pace with military applications

Vendors of high-speed SRAMs will be aiming innovative commercial SRAM technologies at military targets.



As vendors of military static RAMs are engaged in a slow and steady march toward access times of below 10 ns and densities of 4 Mbits, their customers are lagging behind the technology curve. But even though the military will eventually transition to the speedier devices, designers are expected to employ classic SRAM architectures for some time to come. Unlike their commercial brethren, the military eschews the bells and whistles available on the processor-specific SRAMs used in commercial workstations and high-performance personal computers.

Nevertheless, military SRAM vendors and customers alike must track innovative commercial offerings as they monitor possible military and aerospace applications for today's commercial devices. That's not hard to do for most military SRAM vendors because the majority of their sales go to commercial markets.

For their part, military customers must prepare to adopt new technologies for two reasons: supplies of traditional configurations are dwindling; and they will face increasing pressure to adopt economical derivatives of high-volume commercial product lines.

Overall, the military SRAM market falls below the radar of most market researchers. However, an analyst at Dataquest (San Jose, Calif.) places 1994 military SRAM sales at $150 million, or less than 4 percent of the total worldwide market. Commercial product enjoys a $4.1 billion worldwide market.

Consequently, many vendors have stopped building military SRAMs, leaving the market to a handful of companies. The firms that are left strive to keep producing established product lines while adapting state-of-the-art commercial devices to military performance requirements in anticipation of demand for such parts.

But, the business is brutal. Three years ago, as prices plummeted, a number of military dynamic and static RAM makers exited the market. Today, the pros-pects for mil-spec DRAM and SRAM vendors are not much better. Defense budget cuts and fewer new platforms translate into a flat or slow growth market for memory makers through the end of the decade.

To stay afloat in the sluggish defense market, DRAM and SRAM manufacturers need a niche. One such promising niche that some vendors are counting on in the near term is the radiation-hardened memory market. That is, as long as commercial and military satellites keep taking to the sky.

Memory consumption in the North American military and aerospace market this year totals about $271 million, including DRAMs, SRAMs, EPROMs, ROMs/PROMs, EEPROMs, and Flash, and other FIFOs, according to Dataquest Inc. The DRAM market accounts for about $38 million, or about 7 percent, while SRAMs represent $109 million, or about 25 percent. By 1997, the DRAMs market will increase to about $42 million and SRAMs will rise to $122 million, Dataquest says.

Within the SRAM market, manufacturers are gearing up for 1-Mbit chip production. In 1993, about 36 percent of the SRAM market in the military was for 64-kbit parts, 44 percent for 256-kbit parts and 20 percent for 1-Mbit parts. In 1997, however, these numbers will change dramatically, as the 1-Mbit parts proliferate into programs and the 4-Mbit parts become standard. Three years from now, only 12 percent of the market will be devoted to 64-kbit parts, 20 percent to 256-kbit parts, while 68 percent will be for 1-Mbit parts, Dataquest forecasts.

Beside the new parts, there are still some issues vendors must address for military customers, including data retention, lower power, speed, die size, and packaging. Even though the military wants more bang for its buck, it is constrained by the additional cost associated with putting higher-performance, lower-power memory into smaller packages. M&AE

MIL-SPEC AND FAST SRAMs (70NS AND FASTER)

Model	Density (bits)	Organization (bits)	Access times (ns)	Technology (CMOS, BICMOS, etc.)	Packages (DIP, LCC, etc.)	Synchronous (yes/no)	Power dissipation (mW)	Mil-specs and/or QML	Availability	Price (quantity)	Comments (descriptions, options, special features)
Austin Semiconductor Inc., 8701 Cross Park Drive, Austin, TX 78754 (512) 339-1188, fax (512) 835-8358 Circle 322											
MT5C256K16	4096 k	256 k x 16	20, 25, 35	CMOS	CDIP, LCC, FP, SOJ	No	500TYP-1000ABS max	Mil-Std-883	Q4 95	< 50 pcs. @ ~$1,000	3.3V, 5V TTL compatible center power & ground
MT5LC512K8	4096 k	512 k x 8	20, 25, 35, 45, 55	CMOS	CDIP, LCC, FP, SOJ	No	500TYP-1000ABS max	Mil-Std-883	Q3 95	< 50 pcs. @ ~$1,000	3.3V, 5V TTL compatible center power & ground
MT5LC1M4	4096 k	1 M x 4	20, 25, 35, 45, 55	CMOS	CDIP, LCC, FP, SOJ	No	500TYP-1000ABS max	Mil-Std-883	Q4 95	< 50 pcs. @ ~$1,000	3.3V, 5V TTL compatible center power & ground
AS5C512K8	4096 k	512 k x 8	20, 25, 35, 45, 55	CMOS	CDIP, LCC, FP, SOJ	No	800TYP-1000ABS max	Mil-Std-883	Q1 95	< 50 pcs. @ ~$1,000	5V Conventional 32-pin, corner power for ease of upgrade from 1M & 36-pin center power
MT5C1008	1024 k	128 k x 8	15, 20, 25, 35, 45, 55, 70	CMOS	CDIP, LCC, FP, SOJ	No	500TYP-1000ABS max	Mil-Std-883	Now	< 50 pcs. @ ~$106.50	Dual chip enable
MT5C1009	1024 k	128 k x 8	15, 20, 25, 35, 45, 55, 70	CMOS	CDIP, LCC, FP, SOJ	No	500TYP-1000ABS max	Mil-Std-883	Now	< 50 pcs. @ ~$106.50	Single chip enable
MT5C1005	1024 k	256 k x 4	15, 20, 25, 35, 45, 55, 70	CMOS	CDIP, LCC, FP, SOJ	No	500TYP-1000ABS max	Mil-Std-883	Now	< 50 pcs. @ ~$106.50	—
MT5C1001	1024 k	1 M x 1	15, 20, 25, 35, 45, 55, 70	CMOS	CDIP, LCC, FP, SOJ	No	500TYP-1000ABS max	Mil-Std-883	Now	< 50 pcs. @ ~$106.50	—
Cypress Semiconductor, 3901 No. First Street, San Jose, CA 95134 (408) 943-2716, fax (408) 943-2741 Circle 323											
CY7C199	256 k	32 k x 8	15, 20, 25, 35, 45	CMOS	DIP, LCC, FP	No	825	5962-88662	Now	-15 = $63.35 @ 100	—
CY7B185	64 k	8 k x 8	10, 12, 15	BICMOS	DIP, LCC	No	853	5962-91594	Now	-12 = $60 @ 100	—
CY7C185A	64 k	8 k x 8	20, 25, 35, 45	CMOS	DIP, LCC, FP	—	742	5962-38294	Now	-20 = $17.10 @ 100	—
CY7C128A	16 k	2 k x 8	20, 25, 35, 45	CMOS	DIP, LCC	No	687	—	—	-20 = $24.20	—
Dense-Pac Microsystems Inc., 7321 Lincoln Way, Garden Grove, CA 92641-1428 (714) 898-0007, fax (714) 897-1772 Circle 324											
DPS2MX16MKx3	32 M	2 M x 16	25 - 45	CMOS	SLCC, SOJ, SOG	No	1. 3960 max	—	Now	—	Byte addressable
DPS512X16MKx3	8 M	512 k x 16	25 - 45	CMOS	SLCC, SOJ, SOG	No	1980 max	—	Now	—	Byte addressable
DPS512M8MK	4 M	512 k x 8	25 - 45	CMOS	SLCC, SOJ, SOG	No	990 max	—	Now	—	Byte addressable
DPS2MX32MKV3	64 M	2 M x 32	25 - 45	CMOS	66-pin PGA	No	4440 max	—	Q1 '95	—	Byte addressable
DPS512X32MKV3	16 M	512 k x 32	25 - 45	CMOS	66-pin PGA	No	3960 max	—	Q1 '95	—	Byte addressable
DSPS128M8	1 M	128 k x 8	17 - 45	CMOS	LCC, SLCC, SOJ, SOG, PGA50	No	1000 max	—	Q1 '95	—	.45x.55 LCC
Electronic Designs Inc., One Research Drive, Westboro, MA 01581 (508) 366-5151, fax (508) 836-4850 Circle 325											
EDI88512CA	4 Mbit	512 k x 8	20 - 45	CMOS	DIP, CSOJ, Flatpack, TSOP	No	1 W	Mil-Std-883	Q1 95	—	—
EDI88128CS	1 Mbit	128 k x 8	20 - 55	CMOS	DIP, CSOJ, Zip Flatpack, LCC	No	1 W	5962-89598, Mil-Std-883	Now	—	—
EDI8C32128C	4 Mbit	128 k x 32	20 - 55	CMOS	66-pin PGA, 68-pin JLCC	No	1 W	—	Now	—	Byte addressable
EDI84256CS	1 Mbit	256 k x 4	20 - 55	CMOS	DIP, LCC, CSOJ	No	1 W	5962-91612, Mil-Std-883	Now	—	Common I/O
EDI8M32256C	8 Mbit	256 k x 32	25 - 55	CMOS	60-pin DIP	No	1 W	—	Now	—	—

MIL-SPEC AND FAST SRAMs (70NS AND FASTER)

Model	Density (bits)	Organization (bits)	Access times (ns)	Technology (CMOS, BICMOS, etc.)	Packages (DIP, LCC, etc.)	Synchronous (yes/no)	Power dissipation (mW)	Mil-specs and/or QML	Availability	Price (quantity)	Comments (descriptions, options, special features)
Harris Semiconductor Military & Space Products, P.O. Box 883, Melbourne, FL 32901 (407) 724-7000, fax (407) 729-5261 Circle 326											
HS-65758RH	256 k	32 k x 8	35	CMOS Rad Hard SOI	DIP, Flatpack, LCC	No	522	Space Class S & Class B	26 weeks ARO	$2,400 (100)	LET >90
HS-65647RH	64 k	8 k x 8	50	CMOS Rad Hard SOS	DIP, Flatpack	No	473	Class S&B	26 wks. ARO	$1,400	LET >250
HS-65643RH	64 k	64 k x 1	50	CMOS Rad Hard SOS	DIP, Flatpack	No	193	Class S&B	26 wks. ARO	$1,400	LET >250
Honeywell Solid State Electronics Center, 12001 State Hwy 55, Plymouth, MN 55441 (800) 323-8295, fax (612) 954-2051 Circle 327											
HC6856	256k	32k x 8, or 64k x 4, or 256k x 1	20	RICMOSIV	36-pin Flatpack, 28-pin Flatpack, 28-pin DIP	No	<50 Mw per MHz	QML or 883 Class S	Now	Call	Radiation insensitive Total dose 1 Meg Rad SEU <1E-10 Upsets/Per bit day
HX6856	256k	32k x 8, or 64k x 4, or 256k x 1	15	RICMOSIV SOI	36-pin Flatpack	No	< 20 Mw per MHz	QML '95/883 Class S	Now	Call	Radiation insensitive Total dose 1 Meg Rad SEU <1E-11 Upsets/Per bit day
HX6828	1 Meg	128k x 8	15	RICMOSIV SOI	40-pin Flatpack	No	Call	Call	Call	Call	Radiation insensitive Total dose 1 Meg Rad SEU <1E-11 Upsets/Per bit day
Integrated Device Technology Inc., 2975 Stender Way, Santa Clara, CA 95054 (408) 492-8620, fax (408) 492-8674 Circle 328											
IDT 71024	1 M	128 k x 8	15 (mil & com)	CMOS	Cerdip, LCC	No	990 mW active, 82 mW standby	883B	Now	$115/ 1,000 pcs.	—
IDT 71028	1 M	256 k x 4	15 (mil & com)	CMOS	Sidebraze, DIP, LCC	No	960 mW active, 82 mW standby	883B	Now	$115/100 pcs.	—
IDT 71V256	256 k	32 k x 8	15 (com)	CMOS	Plastic DIP, SOJ, TSOP	No	264 mW active, 1.65 mW standby	—	Now	$9/1,000pcs.	Full 3.3V SRAM
IDT 71256	256 k	32 k x 8	25 (mil), 20 (com)	CMOS	Cerdip, LCC, Cerpack	No	825 mW active, 110 mW standby	883B/ DESC	Now	$30/1,000pcs.	—
IDT 7164	64 k	8 k x 8	20 (mil), 15 (com)	BICMOS	Cerdip, LCC, Cerpack	No	990 mW active, 110 mW standby		Now	$29/1,000pcs.	—
IDT 6116	16 k	2 k x 8	20 (mil), 15 (com)	BICMOS	Cerdip, LCC, Cerpack	No	825 mW active, 55 mW standby		Now	$24/1,000pcs.	—
IDT 7188	64 k	16 k x 4	20 (mil), 15 (com)	BICMOS	Cerdip, Cerpack	No	880 mW active, 137 mW standby		Now	$29/1,000pcs.	—
IDT 7198	64 k	16 k x 4	20 (mil)	CMOS	Cerdip, LCC	No	880 mW active, 137 mW standby		Now	$29/1,000pcs.	Additional Chip Select and Output Enable
Intel Corp., 5000 W. Chandler Blvd., Chandler, AZ 85226 (800) 628-8686, fax (602) 554-6167 Circle 329											
M2147H	4 k	4 k x 1	45, 55, 70	HMOSII	18-pin DIP	No	600 (typical)	Mil-Std-883	Now	$6.10 (1K)	Power down mode
M2148H	4 k	1 k x 4	55, 70	HMOSIII	18-pin DIP	No	600 (typical)	Mil-Std-883	Now	$8.42 (1K)	Power down mode
Logic Devices Inc., 628 East Evelyn Avenue, Sunnyvale, CA 94086 (408) 737-3300, fax (408) 733-7690 Circle 330											
L7C108/109	1 Meg	128 k x 8	25, 20, 17, 15	CMOS	DIP, SOJ, Ceramic LCC	No	550 mW @ 25 ns	Mil-Std-883	Now	$19.33 @ 100 for 25 ns P-DIP	—
L7C174	64 k	8 k x 8	35, 25, 20, 15, 12	CMOS	DIP, SOJ, Ceramic LCC	No	300 mW @ 35 ns	Mil-Std-883	Now	$4.32 @ 100 for 25 ns P-DIP	Cache-tag
L7C 199	256 k	32 k x 8	35, 25, 20, 15	CMOS	DIP, SOJ, Flatpack	No	350 mW @ 25 ns	Mil-Std-883	Now	$4.53 @ 100 for 25 ns P-DIP	—
L7C197	256 k	256 k x 1	35, 25, 20, 15	CMOS	DIP, SOJ, Ceramic LCC	No	165 mW @ 25 ns	Mil-Std-883	Now	$4.53 @ 100 for 25 ns P-DIP	—

MIL-SPEC AND FAST SRAMs (70NS AND FASTER)

Model	Density (bits)	Organization (bits)	Access times (ns)	Technology (CMOS, BICMOS, etc.)	Packages (DIP, LCC, etc.)	Synchronous (yes/no)	Power dissipation (mW)	Mil-specs and/or QML	Availability	Price (quantity)	Comments (descriptions, options, special features)
Loral Federal Systems Manassas, 9500 Godwin Drive, Manassas, VA 22110 (703) 367-4754, fax (703) 367-3642 Circle 331											
1M	—	1 M x 1, 256 k x 4, 128 k x 8	1 M	Bul k CMOS on EPI	40 FP	No	<30 mW/MHz active, <10 mW standby	QML-Q&V	Now	—	—
256 K-30 ns	—	256 k x 1, 32 k x 8	256 K-30 ns	Bul k CMOS on EPI	36 FP, 40 FP, 32 LCC	No	<30 mW/MHz active, <10 mW standby	QML-Q&V	Now	—	—
255 K-40 ns	—	256 k x 1, 32 k x 8	255 K-40 ns	Bul k CMOS on EPI	36 FP, 40 FP, 32 LCC	No	<30 mW/MHz active, <10 mW standby	QML-Q&V	Now	—	—
256 K-60 ns	—	256 k x 1, 32 k x 8	256 K-60 ns	Bul k CMOS on EPI	36 FP, 40 FP, 32 LCC	No	<30 mW/MHz active, <10 mW standby	QML-Q&V	Now	—	—
64 K	—	64 k x 1, 8 k x 8	64 K	Bul k CMOS on EPI	36 FP, 32 LCC	No	<50 mW/MHz active, <10 mW standby	QML-Q&V	Now	—	—
Matra MHS, 2201 Laurelwood Rd., Santa Clara, CA 95056-0951 (408) 970-5851, fax (408) 748-0439 Circle 332											
MM67130/140	DPR master/slave	1 k x 8	35 - 90	CMOS	DIP, LCC, CQPJ	No	n/a	Mil-Std-883D, SMD, SCC 9000	Now	Contact Matra MHS	Avail. in VCC=3V and radiation-tolerant ver.
MM67132/142	DPR master/slave	2 k x 8	35 - 90	CMOS	DIP, LCC, CQPJ	No	n/a	Mil-Std-883D, SMD, SCC 9000	Now	Contact Matra MHS	Same as above
MM67024	DPR	4 k x 16	45 - 55	CMOS	DIP, LCC, CQPJ, PGA	No	n/a	Mil-Std-883D, SCC 9000	Now	Contact Matra MHS	Same as above
MM67025	DPR	8 k x 16	45 - 55	CMOS	DIP, LCC, CQPJ, PGA	No	n/a	Mil-Std-883D, SCC 9000	Call MHS	Contact Matra MHS	Same as above
MM67202	FiFo	1 k x 9	30 - 120	CMOS	DIP, LCC	No	n/a	Mil-Std-883D, SMD, SCC 9000	Now	Contact Matra MHS	Same as above
MM67203	FiFo	2 k x 9	30 - 80	CMOS	DIP, LCC	No	n/a	Mil-Std-883D, SMD, SCC 9000	Now	Contact Matra MHS	Same as above
MM67204	FiFo	4 k x 9	30 - 120	CMOS	DIP, LCC	No	n/a	Mil-Std-883D, SMD, SCC 9000	Now	Contact Matra MHS	Same as above
MM67205	FiFo	8 k x 9	30 - 80	CMOS	DIP, LCC	No	n/a	Mil-Std-883D, SMD, SCC 9000	Now	Contact Matra MHS	Same as above
Paradigm Technology Inc., 71 Vista Montana, San Jose, CA 95134 (408) 954-0500, (408) 954-8913 Circle 333											
PDM41024	1 Meg	128 k x 8	20, 25, 35, 45, 55	CMOS	DIP, LCC	No	908 mW max	5962-89598	Now	Call	LCC Pkg = 32L 450x550
PDM41256	256 k	32 k x 8	15, 20, 25, 35, 45	CMOS	DIP, LCC	No	880 mW max	5962-88552, 5962-88662	Now	Call	LCC Pkg = 32L 450x550
PDM41096	4 Meg	512 k x 8	20, 25, 35, 45, 55	CMOS	FP, DIP	No	1155 mW max	Mil-Std-883	Q4 94	Call	—
PDM41028	1 Meg	256 k x 4	20, 25, 35, 45	CMOS	DIP	No	908 mW max	Mil-Std-883	Now	Call	—
Performance Semiconductor, 610 East Weddell Drive, Sunnyvale, CA 94089 (408) 734-8200, ext. 401, fax (408) 734-0962 Circle 334											
P4C164	64 k	8 k x 8	20, 25	CMOS	DIP, LCC	No	650	Mil-spec	Now	$30 (1,000)	—
P4C188	64 k	16 k x 4	20, 25	CMOS	DIP, LCC	No	660	Mil-spec	Now	$30 (1,000)	—
P4C187	64 k	64 k x 1	15, 20	CMOS	DIP, LCC	No	700	Mil-spec	Now	$30 (1,000)	—
P4C116	16 k	2 k x 8	20, 25	CMOS	DIP, LCC	No	675	Mil-spec	Now	$20 (1,000)	—
Sac-Tec Labs Inc. 23625 Madison Street, Torrance, CA 90505 (310) 375-5295, fax (310) 375-9647 Circle 335											
Custom	—	—	—	—	Hermetic Class S&B	—	—	Mil-Std-883	—	—	—
Memory modules	1-2 Mbytes	8 - 512 k x 8	—	—	Class S&B	—	—	Mil-Std-883	—	—	—
MCM hybrids	18 Mbytes	8 bit wide	—	—	Class S&B	—	—	Mil-Std-1772	—	—	—

MIL-SPEC AND FAST SRAMs (70NS AND FASTER)

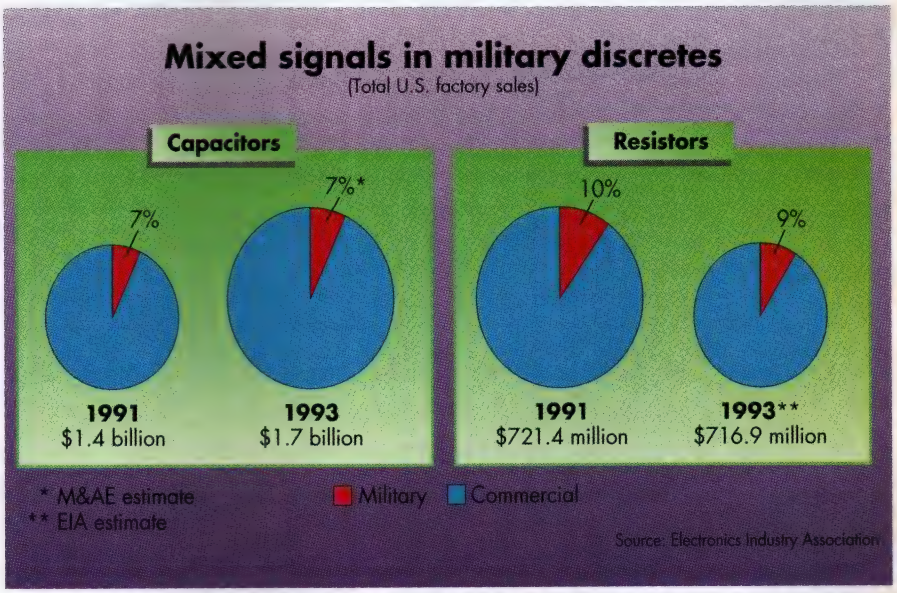
Model	Density (bits)	Organization (bits)	Access times (ns)	Technology (CMOS, BICMOS, etc.)	Packages (DIP, LCC, etc.)	Synchronous (yes/no)	Power dissipation (mW)	Mil-specs and/or QML	Availability	Price (quantity)	Comments (descriptions, options, special features)
United Technologies Microelectronics Ctr, 1575 Garden of the Gods Rd., Colorado Springs, CO 80907 (800) 645-UTMC, fax (719) 594-8032 Circle 336											
UT67164	64 k	8 k x 8	-70, -55	CMOS	28-pin DIP, Flatpack	No	220 mW @ 1 MHz	QPL B&S, Class B&S	Now	—	Rad-Hard
UT7156	256 k	32 k x 8	-55, -45	CMOS	28-pin DIP, Flatpack	No	110 mW @ 1 MHz	QML-Q&V	Now	—	Rad-Hard
White Microelectronics, 4246 E. Wood Street, Phoenix, AZ 85040 (602) 437-1520, fax (602) 437-9120 Circle 337											
WS256K8-XCX	2 Mbit	256 k x 8	25 - 70	CMOS	DIP	No	—	5962-93157	Now	—	—
WS512K8-XCX	4 Mbit	512 k x 8	17 - 70	CMOS	DIP	No	—	5962-92078	Now	—	Rad-tolerant
WS128K32-XHX	4 Mbit	128 k x 32	17 - 70	CMOS	PGA	No	—	5962-93187	Now	—	Rad-tolerant
WS128K32-XG4X	4 Mbit	128 k x 32	17 - 70	CMOS	CQFP	No	—	Mil-temp	Now	—	Rad-tolerant
WS128K32-XG4TX	4 Mbit	128 k x 32	17 - 70	CMOS	CQFP	No	—	Mil-temp	Now	—	Low-profile package
WS512K32-XHX	16 Mbit	512 k x 32	25 - 70	CMOS	PGA	No	—	Mil-temp	Q1 95	—	—
WS512K32-XG4X	16 Mbit	512 k x 32	25 - 70	CMOS	CQFP	No	—	Mil-temp	Q1 95	—	—
WS512K32-XG4TX	16 Mbit	512 k x 32	25 - 70	CMOS	CQFP	No	—	Mil-temp	Q1 95	—	Low-profile package

MIL-SPEC DRAMs

Model	Organization (bits)	Access times (ns)	Power dissipation (mW)	Power Voltages (V)	Modes	Packages (DIP, LCC, etc.)	Mil-specs and/or QML	Availability	Price (quantity)	Comments (descriptions, options, special features)
Austin Semiconductor Inc., 8701 Cross Pk. Dr., Austin, TX 78754 (512) 339-1188 Circle 338										
MT4C64 883C	64k1/64 x 4	100, 120, 150	248mW/28mW max/ 303mW/44mW max	1. 5	Fast page	DIP, LCC	Mil-Std-883C/ SMD	Now	Call ASI marketing	Output enable (OE)
MT4C1024 883C	1 M x 1/256 k x 4	70, 80, 100, 120	385mW/17mW max	5	Fast page	DIP, LCC, Flatpack	Mil-Std-883C	Now	Call ASI marketing	DR/Low power (LP)
MT4C100 4J 883C	4 M x 1/1 M x 4	70, 80, 100, 120	495mW/17mW max	5	Fast page	DIP, LCC, CZIP	Mil-Std-883C/ SMD	Now	Call ASI marketing	OE/JEDEC capable
MT4C4M4 883C	4 M x 4	80, 100, 120	660mW/11mW max	5	Fast page	Call ASI engineer	Mil-Std-883C/ SMD	Now	Call ASI engineer	OE
MT42C42 56 883C	256 k x 4	80, 100, 120	385mW/17mW max	5	Fast page	DIP, LCC, Flatpack, DCJ	Mil-Std-883C/ SMD	Now	Call ASI marketing	Multiport/block write
MT42C25 6K16 883C	256 k x 16	70, 80, 90	1210mW/2mW max	5	Fast page	Call ASI engineer	Mil-Std-883C	Now	Call ASI engineer	Multiport/block write
Electronic Designs Inc., One Research Dr., Westborough, MA 01581 (508) 366-5151, fax (508) 836-4850 Circle 339										
EDI4M4096C	4 M x 4	80	2.5 W	5	Page	26-pin ZIP	—	Now	—	Separate I/O
EDI444096C	4 M x 4	80 - 100	—	5	Page	24/28-pin Thinpack Flatpack	Mil-Std-883	Q2 '95	—	75 mil height
EDI441024C	1 M x 4	80 - 100	750mW	5	Page	20-pin ZIP	Mil-Std-883	Now	—	Fast page mode
EDI414097C	4 M x 1		750mW	5	Page	20-pin ZIP	Mil-Std-883	Now	—	Fast page mode
Texas Instruments, 120 & FM1788, Box 60488, Midland, TX 79707 (915) 561-6713 Circle 340										
SMJ4C1024/ SMJ44C256	256 k x 4/1, 204 k x 1	80 - 150	385/275 (active)	4.5 - 5.5	Page	JLCC, SOLCC, CDIP, Flatpack	Mil-Std-883D, SMD	Now	Call TI	—
SMJ44100/ SMJ44400	4 M x 1/1 M x 4	80 - 120	467/385 (active)	4.5 - 5.5	Page	CDIP, Flatpack, LCC, ZIP	Mil-Std-883D, SMD	Now	Call TI	—
SMJ416100/ SMJ416400	16 M x 1/1 M x16	70 - 100	Same as above	4.5 - 5.5	Page	LCC, Flatpack, ZIP	Mil-Std-883D, SMD	Now	Call TI	—

Shrinking pie for military resistors and capacitors

Even though demand for mil-spec discrete components is on the wane, suppliers willing to persevere are finding opportunities.



Defense cuts over the last few years have trickled down to every segment of the military electronics market, including discrete components such as mil-spec resistors and capacitors.

But one company's loss is another's gain. The shrinking base of companies that still manufacture mil-spec discrete components are finding their military business is holding steady and in some cases increasing.

Overall, however, the market is shrinking. According to the Electronics Industry Association (EIA; Washington, D.C.), U.S. factory sales of mil-spec resistors have been on a steady decline since 1991 when they accounted for 10 percent of resistors sold. In 1991, the total sales were $721.4 million with military sales at $72.14 million. Since that time, however, total resistor sales have dropped to $716.9 million, with the military portion falling to $64.5 million.

Capacitors, on the other hand, have had steadily increasing sales in the last few years. In 1991, total U.S. factory sales of capacitors totaled $1.393 billion. By 1993, sales had risen to $1.731 billion. In 1991, the only year for which the EIA has numbers for the military portion of the capacitor market, mil-spec capacitors made up $95.741 million, or nearly 9 percent.

While the EIA has reported a decline in resistor sales over the last few years, the experience of the companies in the market has been inconsistent. Some companies have seen the same decrease the EIA identified, yet others are experiencing growth.

However, most companies are watching the future with caution, in light of Defense Secretary William Perry's June 29, 1994, directive for the military to use commercial parts. Some have expressed concern over the possibility that purchasing people may start buying commercial products that do not have the same degree of reliability that is characteristic of mil-spec parts attached.

Other companies feel the directive will help their business, since the directive to buy commercial product will help fill the void created in the military market by defense cuts.

While some companies hope the commercial sales will make up for their military losses, others hope to find a niche in highly advanced and specialized military product lines.

Specialization gains ground

The news isn't all bad in the military resistor market, however. Several companies are gaining ground in the areas of specialization and customization.

The Defense Electronics Supply Center (DESC), which is responsible for military specifications, appears to be changing its function in light of the William Perry memo.

A major change that will simplify the lives of components manufacturers and possibly help reduce costs is DESC's new directive to base specs on performance.

Most military manufacturers agree such change will have a positive impact on their market. Still, many remain cautious about the growth prospects in the military market. M&AE

MIL-SPEC RESISTORS

Resistor type	Military specifications met	Comments
Amitron Inc., 85 Flagship Drive, North Andover, MA 01845 (508) 686-1882, fax (508) 686-0622 Circle 341		
Thick-film ceramic chip	Mil-R-55342	/3, /4, /6, /7 qualified
Dale Electronics Inc., 1122 23rd St., P.O. Box 609, Columbus, NE 68602-0609 (402) 564-3131, fax (402) 563-6418 Circle 342		
Fixed; wire-wound; power type; chassis-mounted; housed; metal element; established reliability; very low resistance values	Mil-R-26F; Mil-R-18546E; Mil-R-39007G; Mil-R-39009C; Mil-R-49465A	Other Dale plants manufacture additional mil-spec resistors including film; high stability; insulated; chip; networks; high reliability. Contact Dale for factory locations and information.
Huntington Electric Inc., 550 Condit St., Huntington, IN 46750 (219) 356-0776, fax (219) 356-7891 Circle 343		
Wire-wound; fixed; adjustable	Mil-R-26	
Memcor Truohm Inc., 1320 Flaxmill Rd., Huntington, IN 46750 (219) 356-4300, fax (219) 356-7376 Circle 344		
Wire-wound	Mil-R-26; Mil-R-22	Wire-wound resistors and rheostats built to above specs. Also can be supplied with special features.
Mini-Systems Inc., 20 David Rd., P.O. Box 69, North Attleboro, MA 02761-0069 (508) 695-0203, fax (508) 695-6076 Circle 345		
Thick film and thin film chip resistors	Mil-R-55342; Mil-Std-883C	Solderable; wire-bondable; wraparound; one surface
Ohmite Manufacturing Co., 3601 Howard St., Skokie, IL 60076 (708) 675-2600, fax (708) 675-1505 Circle 346		
Wire-wound; fixed; adjustable	Mil-R-22; Mil-R-26; Mil-R- 6749; Mil-R-15109; Mil-R-19365; Mil-R-18546; Mil-R-29; DESC Drawing #89040	
Ohmtek Inc., 2160 Liberty Dr., Niagara Falls, NY 14304 (716) 283-4025, fax (716) 283-5932 Circle 347		
Wrap-around chip; thick film; thin film	Mil-R-55342, characteristics: E&H, K, M	
Pacific Resistor Co., 18300 Oxnard St., Tarzana, CA 91356 (800) 835-3355, (818) 345-7811, fax (818) 345-1507 Circle 348		
Precision and power wire-wound	Mil-R-26; Mil-R-18546	
Piconics, 26 Cummings Rd., Tyngsboro, MA 01879 (508) 649-7501, fax (508) 649-9643 Circle 349		
Thick film; thin film	Mil-R-55342	Characteristic K; /03/04/06/07
RCD Components Inc., 520 E. Industrial Park Dr., Manchester, NH 03109 (603) 669-0054, fax (603) 669-5455 Circle 350		
Thick film; thin film; precision wire-wound; power wire-wound; networks; foil; carbon; ceramic; metal film; fuse; high-voltage; high frequency; surface mount; chassis mount; high megohm; shunts; temperature sensitive zero-ohm jumpers; surge resistors; non-inductive; hybrids	Mil-R-22684; Mil-R-10509; Mil-R-26; Mil-R-122; Mil-R-18546; Mil-R-93; Mil-R-39017; Mil-R-55182; Mil-R-39007; Mil-R-39009; Mil-R-39005; Mil-R-83401; Mil-R-55342; Mil-R-49465	RCD specializes in custom resistors and offers the world's widest range—values from .0002 ohm to 200 teraohm; tolerances from ± .0005% to ± 20%; TCRs from ± 0.25 ppm to +7000 ppm. One week SWIFT delivery service available.
State of the Art, Inc., 2470 Fox Hill Rd., State College, PA 16803 (800) 458-3401, fax (814) 355-2714 Circle 351		
Thick and thin film chip resistors; thick and thin film resistor networks; thick and thin film custom circuits; thin film etched circuits; metallized substrates	Mil-R-55342; Mil-R-914; Mil-R-39032; Mil-I-45208A; Mil-Std-690; Mil-Std-790D; Mil-Std-883; Mil-Std-105E; Mil-Std-1520C; Mil-Std-1535A; Mil-Std-1686A; Mil-Std-202; Mil-Std-45662; Mil-Q-9858;	Only "S" level manufacturer for Mil-R-55342. Screening available to any requirement. Industry's largest burn-in capacity.
Vishay Resistors, 63 Lincoln Highway, Malvern, PA 19355 (610) 644-1300, fax (610) 640-9081 Circle 352		
Bulk Metal foil	Mil-R-22097; Mil-R-83401; Mil-R-55182; capable of meeting Mil-R-39035 and Mil-R-55342	Vishay Military Established Reliability resistors are available in resistance values from 4.99 ohms through 121,000 ohms, and for tolerances from ±0.005% to ±1.0%

MIL-SPEC CAPACITORS

Capacitor type	Military specifications met	Comments
AVX Corp., 17th Ave. So., Myrtle Beach, SC 29578 (803) 448-9411 Circle 357		
Leaded ceramic; surface mount and microwave; glass; tantalum	Mil-C-20; Mil-C-11015; Mil-C-123; Mil-C-39014; Mil-C-55681; Mil-C-23269; Mil-C-11272; Mil-C-49137; Mil-C-55365	
Solid tantalum, SMT, Radial and Axial	Mil-C-55365/4, /8, Mil-C-49137/6	CWR09 SMT, CWR11 SMT, CX06 Radial, CX16 Axial
Chicago Condenser Corp., 2900 W. Chicago Ave., Chicago, IL 60622 (312) 227-7070, fax (312) 227-6646 Circle 358		
Fixed paper and paper film	Mil-C-25; Mil-C-19978; QPLs: C072, CP53, CP54, CP55	Voltage ratings from 600 VDC to 50,000 VDC. Capacitors are housed in CP70-type metal rectangular cans and CP53-type "bathtub" containers as well as custom containers. Custom designs, short lead-time.
Component Research Co., 1655 26 St., Santa Monica, CA 90404 (310) 829-3615, (310) 829-9584 Circle 359		
Polycarbonate; polyphenylene; polypropylene; polystyrene; teflon	M83421/01; M83421/02; M39022/07; M39022/9; M39022/10; M87217/01	
CSI Technologies Inc., 810 Rancheros Dr., San Marcos, CA 92069-3009 (619) 747-4000, (619) 743-5094 Circle 360		
Film; film/paper; all film oil impregnated; foil and metallized construction	Mil-C-19978	Specialist in high-voltage capacitors 500 V to 250 kV
Joslyn Jennings Corp., 970 McLaughlin Ave., San Jose, CA 95122 (408) 292-4025, (408) 286-1789 Circle 361		
Vacuum and gas, fixed and variable high-voltage capacitors	Mil-C-23183	Power communications such as high-power transmitters & electrical and industrial industries. Noted for their superior dielectric strength.
Kemet Electronics Corp., Box 5928, Greenville, SC 29681 (803) 963-6300, (803) 967-6876 Circle 362		
Ceramic MLC—leaded, chips; tantalum—leaded, chips	Mil-C-39014; Mil-C-20; Mil-C-11015; Mil-C-55681; Mil-C-123; Mil-C-39003; Mil-C-49137; Mil-C-55365	
North American Capacitor Co. (Mallory Products), 7545 Rockville Rd., Indianapolis, IN 46214 (317) 273-0090, fax (317) 273-2400 Circle 363		
Wet tantalum—established reliability, non-established reliability	Mil-C-39006 /09, /18, /19, /20, /21, /22, /25; Mil-C-83500 /01 (a); Mil-C-3965 /4 (b)	Silver and tantalum case; high temperature extended ranges; (a) all-tantalum button; (b) silver case, elastomer seal.
Vishay Sprague Inc., P.O. Box 231, 678 Main St., Sanford, ME 04073 (207) 324-4140, fax (207) 324-7223 Circle 364		
Fixed; electrolytic (solid electrolyte); tantalum; established reliability; molded; conformal coded; metal case with plastic end-fill; non-hermetically sealed; general specification; electrolytic (tantalum); chip	Mil-C-39003; Mil-C-49137; Mil-C-55365	Other Vishay Sprague plants manufacture additional mil-spec capacitors including electrolytic (non-solid electrolyte); filters and capacitors; radial frequency/ electromagnetic interference supression; radial frequency interference user. Contact Vishay Sprague for factory locations and information.

Ada 9X expected to fuel Ada compiler market

The Ada market is strong, but the release of Ada 9X will reinforce Ada vendors' commitment to the marketplace.

Choosing a compiler for embedded systems today is a bit like picking a light bulb. The selection is wide, but it is hard to tell one from another. Although compiler manufacturers might argue with the analogy, it is fair to say that the technology is mature. While vendors are tweaking their compilers for performance improvements, the next major technological breakthrough will be moving to Ada 9X (likely to be known as Ada 95) from Ada 83.

The International Standards Organization (ISO) in November 1994 officially approved the changes, which had been referred to as Ada 9X, and the official description of the revised language is expected to be published in ISO/IEC 8652 in early 1995.

At the end of 1994, several players in the Ada market were working toward releasing compilers that incorporate 9X. Tartan Inc. in Monroeville, Pa., was among the first to market with a product that supports features of Ada 9X with its cross compilation development tools targeted to Mil-Std-1750A.

Lee Ehrlichman, one of three temporary managers of the Ada Software Alliance before it became the newly-formed Ada Resource Association said,"I believe 9X is a leap forward for the community. It has object-oriented program capabilities, it corrects mistakes from Ada 83, and adds enhancements that user communities have been asking for."

The worldwide Ada market for compilers and tools is $200 million, of which a majority is still military, said Ralph Crafts, editor and publisher of Ada Strategies in Harper's Ferry, W.Va. Include applications and contracts, and the worldwide market is 20-fold larger, or $4 billion, and is increasing at a rate of 10 percent to 15 percent per year.

"There's a major change in attitude in the Ada world that will have payoffs for defense communities, because commercial use will help fund new breakthroughs that the DoD doesn't have funds for."

— Ralph Crafts,
Editor and Publisher
Ada Strategies
Harper's Ferry, W.Va.

There are still some questions as to how the government will switch Ada 9X into long term projects that are still in the design stage. For example, program managers for the 20-year F-22 program will face the decision of switching to 9X compilers. Industry analysts speculate that most program managers will want to stick to Ada 83 compilers due to their reliability and maturity, although with newer projects, the revised language will likely be chosen so developers can take advantage of the revision's new features.

"There's a major change in attitude in the Ada world that will have payoffs for defense communities, because commercial use will help fund new breakthroughs that the DoD doesn't have funds for," Crafts said.

Compiler vendors, claiming it's no longer enough to simply to optimize code, are also looking at development environments. Tools, such as debuggers, editors, linkers, and loaders, are taking the lead in helping engineers manage their part of software development, especially on large systems like the F-22 Advanced Tactical Fighter, the Boeing 777, and the Eurofighter. Compiler vendors are also working on compilers for parallel architectures and multiprocessor architectures.

Getting closer to standard toolsets

Compiler vendors are keeping a close eye on a few emerging standards for compilation tools. One such standard is the Ada Semantic Interface Specification (ASIS), that provides a programmatic interface into the Ada library from any other kind of tool. An initial ASIS specification was developed by TeleSoft with funding from the Software Technology for Adaptable Reliable Systems (STARS) program.

ASIS will enable CASE tool vendors to integrate their CASE tools tightly with Ada compilation systems. The integration targets traceability and reverse engineering. M&AE

ADA COMPILERS FOR EMBEDDED SYSTEMS

Name of development system	Target processors supported	Emulators supported (including bare-bones support)	Validate ACVC 1.11?	Ada 9x implementation?	Optimization levels (full/reduced/time/space)	Runtime size (minimum number of words and bytes)	User runtime system interface/extensions?	Debugging support	Selective linking?	Graphic user interface support	Compiler written in Ada?	Offers complete Ada language ref. manual chap. 13 support?	Program auto build capability?
Thomson Software Products (formerly Alsys), 10251 Vista Sorrento Pkwy., Ste. 300, San Diego, CA 92020 (619) 457-2700, fax (619) 452-2117 Circle 370													
Alsys Adaworld Cross Development System; RISCAda Cross Development	680x0 family & CPU32, Intel 80x86, Mips R2000, R3000; HP PA-RISC	188-ICE, MSCE-V, ES-1800 & more	Y	Y	F, R, T, S	3 k to 15 k	Y	M, O, X, Y	Y	I, L	Y	Y	Y
Convex Computer Corp., 3000 Waterview Pkwy., Richardson, TX 75080 (214) 497-4000, fax (214) 497-4848 Circle 371													
Convex Ada	C1, C120,C2, C3200, C3400, C3800 (All Convex C-series processors)	—	Y	N	F	—	Y	M, O, Y	Y	—	Y	Y	Y
DDC-I Inc., 410 N. 44th St., Phoenix, AZ 85008 (602) 275-7172, fax (602) 275-7502 Circle 372													
DDC-I, Ada Complier Systems (DACS)	8086, 80x86, Pentium, 80860, 680x0, Mips, 1750A, 290x0, SPARC/ SunOS, SPARC/Solaris, 80x86/UNIX V, PS2/AIX	80X86/80860;Any OMF compatible; 680X0: Any IEEE 695; 1750A: Any HP or Tektronix	Y	Y	F, R, T, S	1.5 kbytes	Y	M, O, X, Y	Y	D, I, L, X	Y	Y	Y
EDS Scicon, 8 New England Executive Park, Burlington, MA 01803 (617) 273-3030 Circle 373													
XD Ada Cross Development System	MC680X0, including MC68340/MC68332 & 1750A	HP, Tektronix, others via IEEE file	Y	N	All levels supported	Motorola : 3 kbytes; 1750A: 1-2 kwords	Y	All levels supported	Y	No	Y	Y	Y
Harris Computer Systems Corporation, 2101 W. Cypress Creek Road, Fort Lauderdale, FL 33309-1892 (305) 973-5122, fax (305) 977-5580 Circle 374													
Harris Ada	Motorola 88100, Motorola 88110, IBM RS6000	No	Y	Plan'd	F, R, T	50-90 kb	Y	Symbolic; Machine; Window; Motif	Y	Bindings to X, XZ, Motif	N-Compiler Y-Toolset	Y	Y
Intermetrics Inc., 733 Concord Ave., Cambridge, MA 02138 (617) 661-1840 Circle 375													
Intermetrics Ada	1750A,1750A, Xmem, RH-32, EWCC	None	Y	N	F	5,000 words	Y	M, O,X,Y	Y	D	Y	Y	Y
Irvine Compiler Corporation, 34 Executive Park, Suite 270, Irvine, CA 92714 (714) 250-1366, fax (714) 250-0676 Circle 376													
ICC Ada for i960	i960KB, MC, XA MM, &MX	ICE960 SIMULATOR	Y	Y	F R T S	Variable	Y	M, O, X, Y	Y	Yes	Y	Y	Y
ICC Real-Time Ada for HP-RT/HP-UX	HP PA-RISC 742rt, 743rt	—	Y	Y	Full	Variable	Y	M, O, X, Y	Y	Yes	Y	Y	Y

Key: D=DECWindows; F=Full; I=Motif; L=OpenLock; M=Machine-level; O=Source; R=Reduced; S=Space; T=Time; X=X-Windows; Y=Symbolic

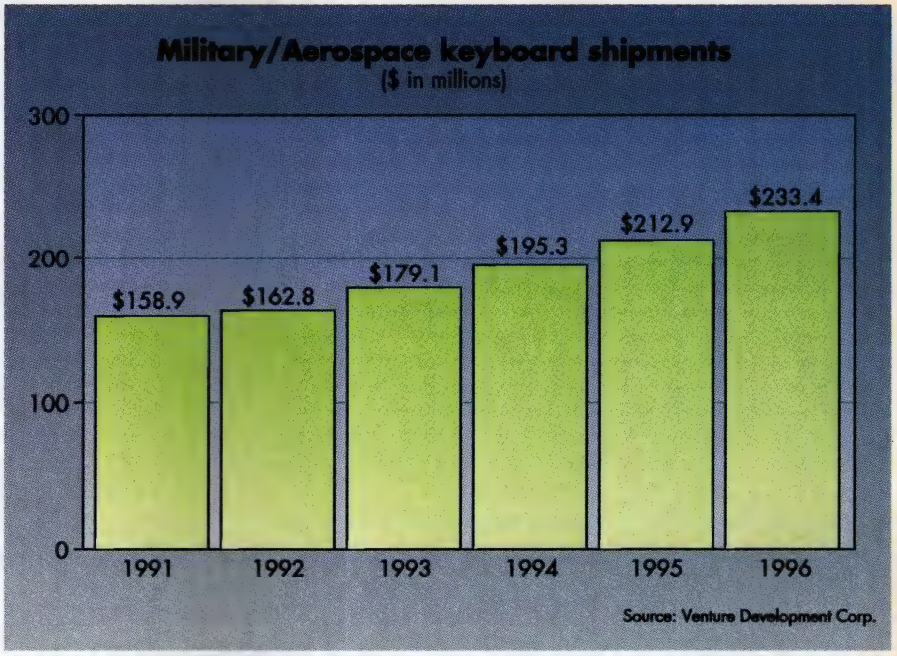
ADA COMPILERS FOR EMBEDDED SYSTEMS

Name of development system	Target processors supported	Emulators supported (including bare-bones support)	Validate ACVC 1.11?	Ada 9x implementation?	Optimization levels (full/reduced/time/space)	Runtime size (minimum number of words and bytes)	User runtime system interface/extensions?	Debugging support	Selective linking?	Graphic user interface support	Compiler written in Ada?	Offers complete Ada language ref. manual chap. 13 support?	Program auto build capability?
Multiprocessor Toolsmiths Inc., 200-302 Legget Drive, Kanata, Ontario, Canada K2K 1Y5 (800) 263-4377, fax (613) 599-6574 Circle 377													
Unison	i860-Many BSPs, 68030/68040-Many BSPs, Sparc-Sun 4/5	—	Y	N	R	—	Y	F, M, O, X, Y	Y	—	N	Y	Y
PSS Inc., 429 Santa Monica Blvd., Ste 430, Santa Clara, CA 90401 (310) 394-5233 Circle 378													
LACE Ada	ZR3432S	GSTB, ZDS-325	Y	N	F, R, S, T	1 k (words)	Y	Yes	Y	D, I	Y	Y	Y
1750A Ada	Mil-Std-1750A	Bare Machine, Runtime	N-1.10	N	F, R, S, T	2 k (words)	Y	Yes	Y	D, I	Y	Y	Y
Rational Software Corp., 2800 San Tomas Expressway, Santa Clara, CA 95051, (408) 496-3600 or (800) RAT-1212, fax (408) 496-3636 Circle 379													
VADS	Motorola PowerPC, 68000/10, 68020/30/40, CPU32, 88100/110, R3000/4000, Sun Sparc, Intel 386/486, IBM RS/6000, Honeywell RH-32, AMD 29K, CDI AAYK-14/AMP, TI MMC, Alpha AXP	HP 647000 supported by debugger interface; 68302; 69020; 68040; 68332; 683340; 68360; Others supported through IEEE 695	Y	Partial	10 levels of optimization; space/time	2 KB scalable to 35 KB	Y	Symbolic; source-level; machine-level; Windows/GUI; Optimized code; Ada/C/C++	Y	Motif/X; other	Y	Y	Y
R.R. Software Inc., P.O. Box 1512, Madison, WI 53701-1512, (608) 251-3133, fax (608) 251-3340 Circle 380													
Janus/Ada embedded 1 Toolkit v.2.2.2c	80x86,8086,8088	Intel ICE, and those using same data format	Y	Y	All F, R, T, S	4K		Machine level; space; symbolic	Y	Windows	Y	Y	Y
Tartan, Inc., 300 Oxford Drive, Monroeville, PA 15146-2346 (800) 856-5255, 412856-3600, fax 412856-3636 Circle 381													
Tartan Ada Development Systems, v5.1	—	i960MC, Tektronix 8540, Honeywell PDU, TI'sXDS, 68xxx, TMS320C3K, C4x, 1960MC, MX, Mil-Std-1750A	Y	Y	F, R, T, S	Varies	Y	M, O Y	Y	I, L	Y	Y	Y
TartanWorks v.4.3	680X0	—	Y	Spr/95	F, R, T, S	20,000 bytes	Y	M, O, Y	Y	I, L	Y	Y	Y
Westinghouse Electric Corp., P.O. Box 746, Baltimore, MD 21203 (410) 765-1000 Circle 382													
MIPS Ada	R3000/4000	MIPS/SGI	Y	N	F	Tailorable	Y	O, Y	Y	No	Partial	Y	Y

Key: D=DECWindows; F=Full; I=Motif; L=OpenLock; M=Machine-level; O=Source; R=Reduced; S=Space; T=Time; X=X-Windows; Y=Symbolic

Input devices: Going beyond rugged

Keyboards still reign, but a number of alternative input technologies are being adapted for military applications.



Although the Department of Defense is adopting a commercial off-the-shelf (COTS) policy for many of its electronics systems, the human-machine interface usually requires some customization and ruggedization to fit the application. Indeed, the military's demand for input devices runs the gamut from fully ruggedized, customized, radiation-hardened, chemical-warfare resistive devices to COTS devices used for administrative functions.

While militarized input devices range from keyboards to mice to pen-based and touch-screen systems, the cornerstone of an input system remains the keyboard.

According to industry insiders, the DoD's demand for keyboards has been growing modestly, and is projected to post about 8 percent growth per year through the middle of the decade. Much of the growth will come from the retrofit and upgrade market. Other non-keyboard input devices, such as touch screens, are seeing stronger growth, according to industry sources.

From full-custom to almost-COTS

There are no standardized military keyboards. Of course, specifications do exist for such things as environmental compliance, but there is nothing that tells manufacturers how many keys should be on a board, or how the equipment should operate.

Even so, there is a tendency to move toward COTS equipment wherever possible to cut costs.

Even with the move to COTS, military keyboard manufacturers face three challenges in designing their boards. First, the necessary backlighting of the keys and the display cannot interfere with night-vision goggles worn in the field by a soldier or a pilot. For keyboards and panels for the aerospace industry, backlighting is critical. Most cockpits are outfitted with a specific light source which is generally a LED or an incandescent lamp. Second, vendors must be able to meet strict environmental specifications, including nuclear/biological/chemical (NBC) requirements and the NBC decontamination process. And third, all keyboards must have a positive tactile feel—the user must be able to feel the snap of the key when it is depressed.

Touch screens gaining ground

Keyboards are being challenged by touch screens in both the commercial world and in defense.

Touch-screen technology is separated into five classes: resistive, capacitive, surface acoustic wave, infrared (IR), and remote-force sensing. Resistive screens are comprised of a piece of glass with a light coating on top of it, basically a two-piece screen. When the screen is touched, both layers meet, and the computer reads where the contact was made. The drawback to resistive technology is that with two screens over the monitor, the resolution can be poor. Also, the monitors are easily damaged.

Capacitive screens are triggered by the objects touching them. Infrared technology uses a grid of IR light beams to detect a touch. The grid of light is broken by a pen or finger, and the coordinates of the broken beam are calculated to locate where the touch was made. Although IR is the most durable technology available, "false touches" are a problem because the beam is broken at a point above the target on the screen, and the touch is never made on the screen.

In addition to keyboards and touch screens, the military uses other input devices, including pen-based systems, trackballs, mice, joysticks, and a newer technology, called spaceballs, for 3-D input. M&AE

KEYBOARDS FOR MILITARY & AEROSPACE APPLICATIONS

Model #	Key configuration	Data interfaces	Total weight	Water sealing	Operating temperature (°C)	Chemical resistance (such as NBC compliance)	Backlighting of keys? (yes/no)	Mil-Specifications met
Aitech Defense Systems, Inc., 3080 Olcott St., Suite 105 A, Santa Clara, CA 95054 (408) 980-6200, fax (408) 980-6161 Circle 388								
K101	103 keys PC/AT type	TTL Full PC/AT coding	<56.5 lbs.	Fully immersible	-40° to +85°	—	No	Mil-E16400, Mil-S901, Mil-Std-810, -167-1
Codar Technology, Inc., 2405 Trade Centre Ave., Longmont, CO 80503 (303) 776-0472, fax (303) 776-8532 Circle 389								
Talon	107 full-travel	RS-423, RS-232	5 lbs.	Yes	0° to +50°	Optional	No	Mil-Std-810, 461, 454, 202, 167
Corton, Inc., 1 Aegean Drive, Methuen, MA 01844 (508) 975-5445 Circle 390								
DIN-121	121 keys w/Trackball or Force Sensor Rackmount	IBM AT/RS232; IBM PS/s/PS/2; SUN type 5; DEC LK401; NCD/SUN	<5.3 lbs.	Rain/Spill	-20° to +70°	Partial Resistance	No	Mil-STD-461, 810, Tempest
DIN-506	101 IBM style AN/UYQ-70; AN/UYQ-65	IBM AT/PS/2; DEC LK401; SUN type 5; RS232	6.0 lbs.	Rain/Spill	0° + .50°	Partial Resistance	Yes	Mil-Std-461, 810, 167, 901, 108
DIN-109	109 keys FAA Common Console	RS422, 9600 baud; SUN type 4/5	6.8 lbs.	Drip	0° + .50°	No	Upgrade-able	FCC Class B
DIN-509	82/84 keys Laptop Style	IBM AT/PS/2; SUN Type 5	4.2 lbs.	Rain/Spill	0° + .50°	Partial Resistance	No	Mil-STD-810
Cyberchron Corp., PO Box 160, Cold Spring, NY 10516, (914) 265-3700, fax (914) 265-4154 Circle 391								
CRX-series	Custom controllers	IBM PC/AT,HP,SUN	3-5 lbs.	Drip/Splashproof	Operating: -25° to +65°	Mil-C-5541, paint per TT-E-527	Custom only	Mil-Std-810E, 167- 1,461D, Tempest
Datametrics Corp., 8966 Comanche Avenue, Chatsworth, CA 91311 (818) 341-2901 Circle 392								
DMC 7200	101-KEY	PC/XT/AT	5.5 lbs.	Immersible	-25° to +60°	—	No	—
DMC 7950	ANSI X3, 154	Synchronous 8-bit serial data output	<2.0 lbs.	Splash and spill submersible	-25° to +60°	—	No	Mil-Std-461, Mil-Std-810
Eaton Corp., Aerospace Controls Division, 1640 Monrovia Avenue, Costa Mesa, CA 92627 (714) 642-2427, fax (714) 722-4475 Circle 393								
Custom products	Custom Design per Program	RS-232, ARINC-429, Mil-Std-1553	Lightest avail. within customer specification	Drip/Splashproof, immersible	-55° to +95°	NBC Decontamina-tion	Yes	Mil-P-7788F, Mil-L-85762A, Mil-Std-810
E-L FlexKey Technologies, 77 Olean Road, East Aurora, NY 14052 (716) 655-0800, fax (716) 885-1476 Circle 394								
Custom and COTS	Std. PC, QWERTY cus-tom and matrix	PC/AT, PS/2, DEC LK201, SUN, Macintosh RS-232/422, Custom	Keypad: 5-16 oz.; Kybd: 3-6 lbs.	Immersion; Spillproof; Wind/Rain	Max: -54° to +85°	NBC oils	Yes; E-L, LED, incand.	Mil-Std-202, 285, 461, 810, 85762 Mil-P-7788
George Risk Industries, Inc., 802 South Elm Street, Kimball, NE 69145-1599 (308) 235-4645, fax (308) 235-2609 Circle 395								
Standard Product Customized	Varies; per customer request	AT/PS2, RS232, RS422, TTL; per customer request	2 to 5 lbs.	Splashproof, Semi-sealed	0° to +70°; -55° to +80°	Standard	Optional	Mil-Std-810D, 108, 461, 454; Mil-E-16400; Mil-T-28800; Mil-Std-1657, 461

KEYBOARDS FOR MILITARY & AEROSPACE APPLICATIONS

Model #	Key configuration	Data interfaces	Total weight	Water sealing	Operating temperature (°C)	Chemical resistance (such as NBC compliance)	Backlighting of keys? (yes/no)	Mil-Specifications met
Industrial Electronic Engineers, Inc., 7740 Lemona Avenue, Van Nuys, CA 91409-9234 (818) 787-0311 Circle 396								
Standard/ Custom	Standard/ Custom	RS-232C, RS-422, -434, Mil-C-188	4-8 lbs.	Mil-Std-810	-46° to +71°	NBC for short-term exposure	Yes	Mil-E-5400, 16400, Mil-Std-454, 461, 901, 810, 910, etc.
Integrix, Inc., 1200 Lawrence Drive #150, Newbury Park, CA 91320 (800) 300-8288 Circle 397								
Type 5 Standard; Custom versions	PC/Sun;auto configures	Serial (8N1) for SUN and PS2	4 lbs.	None	0° to +40°	None	No	No
S5+100	PC/Sun; Type 5	Serial (8N1) & PS2	4 lbs.	None	0° to +40°	None	No	No FCC-class B
Interface Products, Inc., 4630 North Avenue, Oceanside, CA 92056 (619) 945-0230 Circle 398								
C-130 Gunship	QWERTY	RS-422	4 lbs.	Splashproof	—	—	No	Mil-Std-461, -810
S-3A	QWERTY	RS-232	9 lbs.	Splashproof	—	—	Yes	Mil-Std-461, -810
Jay-El Products, Inc., P.O. Box 6240, 23301 S. Wilmington Avenue, Carson, CA 90749-6240 (310) 513-7200 Circle 399								
Custom	Per customer request	RS-232, -423, -422, others	Varies	Submersion to 3 ft.	-55° to +85°	NBC and Mil-P-7788E	Yes	Integrating of LCD, LED displays
Korry Electronics, 901 Dexter Avenue N., Seattle, WA 98109 (206) 281-1300, fax, (206) 281-1365 Circle 400								
Commercial, military	QWERTY, function keys, customized	RS-232, -422, others	Varies	Optional drip proof, submersion	-40° to +85°	NBC and solvents per Mil-P-7788E	Yes	Mil-Std-85762, Mil-Std-810, Mil-Std-461, Mil-S-901, Tempest, etc.
Maxi Switch, Inc., 2901 E. Elvira Road, Tucson, AZ 85706 (602) 294-5450 Circle 401								
—	Custom standard	IBM AT, PC/XT, PS/2, Sparc, Serial	2-4 lbs.	Customized harsh environment	0° to +65°	Varies	Custom	Custom
Transicoil, Inc., PO Box 9011, Valley Forge, PA 19485 (610) 539-4400 Circle 402								
—	Per customer request	XY Matrix. RS-232, ARINC-429, Mil-Std-1553	Varies	Environmentally sealed	-54° to +95°	Full NBC compliance	Yes	Mil-P-7788, Mil-L-85762, 25467D, 27160, 25050, Mil-R-28803
XCEL Corp., 4290 E. Brickell Street, Ontario, CA 91761 (909) 391-4321 Circle 403								
—	Per customer requirements	Custom as required	Varies	Submersible options	Ranges to customer requirements	NBC contamination/decontamination compliance; petrochemical resistant	Yes, including NVIS (Mil-L-85762A) and secure lighting	Mil-Std-454, Mil-Std-461, Mil-Std-810, Mil-Std-1472, Mil-Std-2036, Mil-Std-5400, Mil-Std-16400, Mil-L-85762A
SEM-2000	101 key PC/AT full travel	RS-232, RS-422, RS-423	6 lbs. with enclosure	Drip/Splashproof, Submersion to 1 meter	-51° to +71° or extended temperature	Same as above	Same as above	Same as above
SEM-3000	101 key PC/AT full travel	RS-232, RS-422, RS-423	6 lbs. with enclosure	Drip/Splashproof, Submersion to 1 meter	-51° to +71° or extended temperature	Same as above	Same as above	Same as above

TOUCH SCREENS FOR MILITARY & AEROSPACE APPLICATIONS

Model	Technology	Resolution (DPI)	Platform compatibility	Ports	Software compatibility	Technical instal req. (yes/no)	Price (Cost of installation)
Carroll Touch, 811 Paloma Dr., Round Rock, TX 78664 (512) 388-5615 Circle 416							
Modular/2LP	Scanning IR	Physical .025x.025/ Logical .0125x.0125	Serial, ISA bus	n/a	Windows, DOS, others	n/a	n/a
9-in. flat panel touch frame	Scanning IR	Same as above	Same as above	Serial	Same as above	n/a	n/a
19-x30-in. flat panel touch frame	Scanning IR	Same as above	Same as above	Serial, ISA bus	Same as above	n/a	n/a
Dale Electronics, Inc., 23rd St., P.O. Box 609, Columbus, NE 68601 (402) 564-3131 Circle 417							
TIP-3216	IR LED	0.125 in.	Fits plasma, EL, LCD screens	RS-232	Windows, DOS, mouse emulator	Yes	$268 (100)
TIP-3220	IR LED	0.125 in.	Same as above	RS-232	Same as above	Yes	$283 (100)
TIP-3526	IR LED	0.125 in.	Same as above	RS-232	Same as above	Yes	$327 (100)
TIP-3224	IR LED	0.125 in.	Same as above	RS-232	Same as above	Yes	$311
Elographics, Inc., 105 Randolph Rd., Oak Ridge, TN 37830 (615) 482-4100 Circle 418							
P284-UVGA	Surface Acoustic wave	Varies	Fits CRTs, flat panels, (EL, LCD, gas plasma)	Serial RS-232 or PC bus OS/2, MS-DOS	Windows, Macintosh	Yes	n/a
P274-UVGA	Resistive	Varies	Same as above	Serial, PC bus, Micro Channel	Same as above	Yes	n/a
P274-17UVGA	Resistive	Varies	Same as above	Same as above	Same as above	Yes	n/a
MicroTouch Systems, Inc., 55 Jonspin Rd., Wilmington, MA 01887 (508) 694-9900 Circle 419							
ClearTek 2000	Capacitive	1,024x1,024	Windows, DOS, OS/2, Amiga, Macintosh, Unix, X-Windows	Serial or PC bus	All	Yes	Varies
True Point	Capacitive	1,024x1,024	Same as above	Same as above	All	No	n/a
QuickPoint	Capacitive	1,024x1,024	Same as above	Same as above	All	No	n/a
Touch Mate	Capacitive Force Sensing	40	PC OS/2	Serial	DOS, Windows	No	$565
Touch Pen	Analog Capacitive	2,048x2,048	PC OS/2	Serial	DOS, Windows, OS/2	Varies	$640-$1,200
Thru Glass	Discrete Capacitive	n/a	PC, Amiga	Serial	DOS, Windows	Yes	$495-$895
UCE, Inc., 35 Rockland Rd., Norwalk, CT 06854 (203) 838-7500, fax (203) 838-2566 Circle 420							
IDA 2464	Resistive	2,600	As required	Parallel	C+	No	$2,500
IDD	Resistive	Application specific	As required	Serial/Parallel	A/D	No	Typical 500/sq in.
Visage, Inc., 1881 Worcester Rd., Framingham, MA 01701 (508) 620-7100 Circle 421							
Touchmate	Remote force sensing	40 DPI	Any computer monitor up to 90 lbs.	Serial Interface Windows, OS/2	MS-DOS	No	$895 MSRP

PEN COMPUTING DEVICES FOR MIL/AERO APPLICATIONS

Product name	Micro-processor	Speed (MHz)	Memory (Mbytes)	Display	Stylus?	Portable (Yes/No)	Commun-ication interface	Operating systems	Mil-specs met	Price
Dauphin Technology, Inc., 377 E. Butterfield Rd., Ste. 900, Lombard, IL 60148 (708) 971-3400 Circle 409										
DTR-1	Cyrix 486 SLC	25	6	640x480 VGA	Cordless	Yes	Parallel, serial, fax/modem, VGA, Ethernet, IDE	DOS 6.0 Windows 3.1, Windows for Pen	—	$2,495
GRID Systems, 1001 North East Loop 820, Fort Worth, TX 76131 (817) 232-5900 Circle 410										
PalmPad	NEC V20	9.54	2	640x400	User defined	Yes	2400 BPS V.22, 440 BPS, V.32	MS-DOS 5.0	None	$2,895
GRIDPAD SL	Intel 386SL	20	4, 8, 20	640x480 VGA	Loose	Yes	Serial port, 2400 BPS data, Fax V.22	MS-DOS 5.0	None	$3,995
Convertible	Intel 386SL, Cyrix 87SLC	25	2, 4, 8	640x480 VGA	User defined	Yes	Serial port or 2400 BPS V.22 or 14400 BPS V.32	MS-DOS 5.0	None	$3,495
Tusk, Inc., 3980 RCA Blvd., Ste. 8012, Palm Beach Gardens, FL 33410 (407) 625-1101, fax (407) 625-1120 Circle 411										
Tusk SuperTABLET II	486 DX2	50	8	640x480 VGA	Cordless, electro-magnetic	Yes	2 ports, parallel, VGA, Ethernet, RJ-11, Docking, Power	Windows for Pen, DOS, OS/2, UNIX	Mil-Std-810, Mil-Std-461	$4,995

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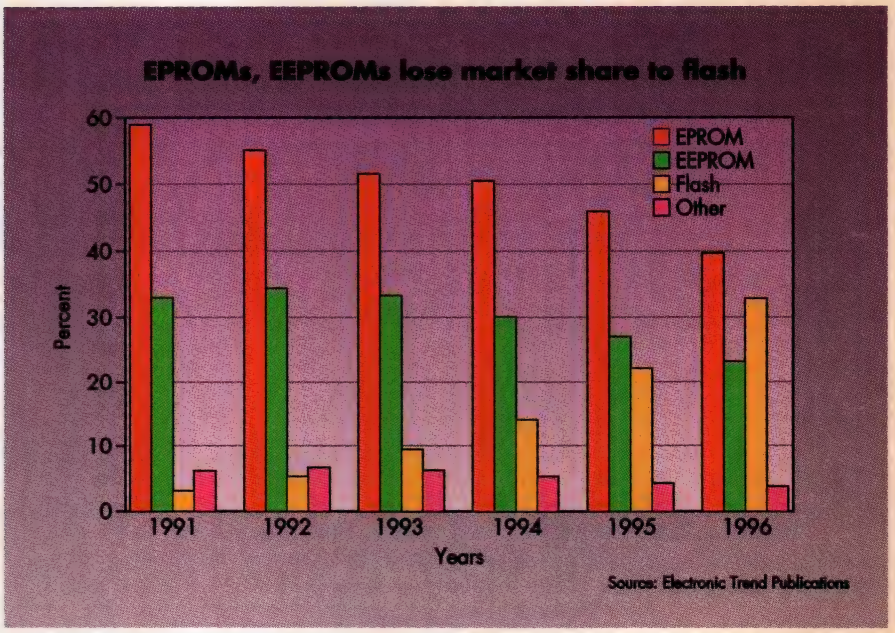
Reliability keeps EEPROMs in the military

Choosing the right non-volatile memory technology for your military application depends on more than just cost. Reliability, durability, rad-hardness, and power consumption also play a role.



With a handful of nonvolatile memory technologies to choose from, the defense and aerospace market still relies heavily on erasable programmable read-only memory (EPROM) and electrically erasable programmable read-only memory (EEPROM), even though cheaper flash nonvolatile technology is available. And resisting the shift to flash, some EEPROM manufacturers are working to improve the technology to extend its military life.

At best, they will only delay the inevitable. Flash is expected to overtake the EEPROM market in the military by 1996, according to market researcher Electronic Trend Publications (ETP; Saratoga, Calif.).

ETP predicts that flash will enjoy 33.4 percent of the U.S. defense and avionics business, while EEPROM will retain only 23.4 percent. Currently, flash has 9 percent of the military market and EEPROM has 33.6 percent. Other nonvolatile technologies, including nonvolatile static RAM and ferroelectric RAM, have about 5.8 percent of the defense market.

ETP predicts that as the defense budget dwindles, the military will buy high-quality commercial-grade products at lower prices than it has paid for mil-spec products. Therefore, EPROM and EEPROM markets will suffer as lower-priced flash technology infiltrates new designs. EEPROM technology does remain much more expensive than flash but EEPROMs have a hold in certain electronics niches.

EEPROMs' high price is due to their two-transistor technology, whereas flash has a single transistor and is more reliable than EEPROMs. According to ETP, EEPROMs offer the best speed/power characteristics. The high speed has made EEPROMs a technology of choice for the military.

The military is attracted to nonvolatile technology, especially EEPROMs, for its ability to retain data after the power source is disengaged. The primary military market for EEPROMs has been avionics, such as map memory for navigation computers and program storage for embedded storage in navigation equipment.

In fact, some in industry believe there will even be growth in EEPROMs as the military shifts away from building new platforms and toward more retrofits. As a rule, new platforms favor flash, while retrofits favor EEPROMs.

Besides cost, military design engineers need to consider other issues when selecting the appropriate nonvolatile memory technology. One factor is erasability. EEPROMs can be erased in individual bits—through a current drain mechanism on the floating-gate transistor—as opposed to bulk erasure for flash and EPROMs. An entire EPROM is erased when exposed to UV light.

Another issue is power. The voltage needed to power EPROMs, EEPROMs, and flash varies. Traditional EPROMS operate at 5 V but need 12 V to charge the CMOS gate. EPROMS are mostly used for storing programs. EEPROMs need a powerful electric charge for programming and must run at 5 V. In 1993, a 5 V option was introduced for flash. This technology does not need separate 12 V circuitry for reprogramming. Traditional flash designs require extra circuitry for reprogramming, which must be done at 12 V. M&AE

EPROMs & EEPROMs

Model #	Technology (EPROM or EEPROM)	Capacity (kbits or Mbits)	Speed-access time (ns)	Speed-write (ns)	Current drain-active (mA)	Current drain-standby (mA)	Voltage (read/write)	Packaging options	Military qualifications	Price (100 pieces)	Availability
Advanced Micro Devices, P.O. Box 3453, MS-82, Sunnyvale, CA 94088 (800) 222-9323 Circle 473											
Am27C64	EPROM	64 kbit	70	1 sec.	25	100	5 V±10%/ 12.75 ±0.25 V	CDIP, LCC	Mil-Std-883C	—	
Am27C128	EPROM	128 kbit	70	2 sec.	25	100	Same as above	CDIP, LCC	5962-87661	—	
Am27C256	EPROM	256 kbit	55	4 sec.	25	100	Same as above	CDIP, LCC	5962-87661	—	
Am27C512	EPROM	512 kbit	90	8 sec.	30	100	Same as above	CDIP, LCC	5962-87648	—	
Am27C010	EPROM	1 Mbit	120	16 sec.	60	100	Same as above	CDIP, LCC	5962-8614	—	
Am27C1024	EPROM	1 Mbit	120	8 sec.	60	100	Same as above	CDIP, LCC	5962-8805	—	
Am27C020	EPROM	2 Mbit	120	32 sec.	60	100	Same as above	CDIP, LCC	5962-90912	—	
Am27C048	EPROM	2 Mbit	120	16 sec.	60	100	Same as above	CDIP, LCC	5962-92140	—	
Am27C040	EPROM	2 Mbit	120	60 sec.	60	100	Same as above	CDIP, LCC	5962-1752	—	
Am27C400	EPROM	4 Mbit	120	32 sec.	60	100	Same as above	CDIP, LCC	Mil-Std-883 C	—	
Am27C4096	EPROM	4 Mbit	120	32 sec.	60	100	Same as above	CDIP, LCC	Same as above	—	
Atmel Corp., 2125 O'Nel Dr., San Jose, CA 95131 (408) 441-0311 Circle 474											
AT28HC256	EEPROM	256 kbits	70	10ms	80	60	5	CERDIP, flatpack, LCC, PGA	SMD 883		Now
ATC28HC256L	EEPROM	256 kbits	90	10 ms	80	3	5	CERDIP, flatpack, LCC, PGA	SMD 883		Now
AT28C010	EEPROM	1 Mbit	120	10 ms	80	0.3	5	Sidebraze, flat-pack, LCC, PGA	SMD 883		Now
AT28C16	EEPROM	16 kbits	120	1ms	45	0.1	5	CERDIP, LCC	SMD 883		Now
AT28C64	EEPROM	64 kbits	120	1ms	45	0.1	5	CERDIP, LCC, flatpack	SMD 883		Now
AT28C64B	EEPROM	64 kbits	150	5ms	60	0.2	5	CERDIP	SMD 883		Now
AT28HC64B	EEPROM	64 kbits	70	5ms	60	0.2	5	CERDIP	SMD 883		Now
AT28C256	EEPROM	256 kbits	150	2ms	60	0.3	5	CERDIP, flatpack, LCC, PGA	SMD 883		Now
Cypress Semiconductor, 3901 N. First St., San Jose, CA 95134 (408) 943-2716 Circle 475											
CY7C258/9	EPROM	32 kbits	12-15	—	90	—	5V/13V	DIP, LCC, JLCC	SMD	$96.35	Now
CY7C261	EPROM	64 kbits	25-55	—	140	40	5V/13V	DIP, LCC, FP	SMD	$45.35	Now
CY7C265	EPROM	64 kbits	15-50	—	140	—	5V/13V	DIP, LCC	SMD	$69.45	Now
CY7C271/4	EPROM	256 kbits	35-55	—	130	40	5V/13V	DIP, LCC, FP	SMD	$103	Now
CY7C276	EPROM	256 kbits	25-35	—	200	—	5V/13V	JLCC, LCC	Mil-Std-883	$129	Now
CY7C287	EPROM	512 kbits	55-65	—	150	—	5V/13V	DIP, LCC	SMD	$181	Now

EPROMs & EEPROMs

Model #	Technology (EPROM or EEPROM)	Capacity (kbits or Mbits)	Speed-access time (ns)	Speed-write (ns)	Current drain-active (mA)	Current drain-standby (mA)	Voltage (read/write)	Packaging options	Military qualifications	Price (100 pieces)	Availability
Electronic Designs Inc., One Research Drive, Westborough, MA 01581 (508) 366-5151, fax (508) 836-4850 Circle 476											
EDI5C32128C	EEPROM	4 Mbits	120	10ms	80	1.5	5V	68 pin JLCC	—	—	
EDI5M3232C	EEPROM	1 Mbit	120	10ms	80	1.5	5V	66 pin PGA	—	—	
EDI7M32128C	FLASH	4 Mbits	120	10ms	100	1.5	5V	66 pin PGA	—	—	
EDI7C32128C	FLASH	4 Mbits	120	10ms	100	1.5	5V	68 pin JLCC	—	—	
EDISM32128C	EEPROM	4 Mbits	120	10ms	80	1.5	5V	66 pin PGA	—	—	
Information Storage Devices, Inc., 2841 Junction Ave., San Jose, CA 95134 (408) 428-1400 Circle 477											
ISD 1000A Family	EEPROM	1 Mbit	n/a	n/a	25	1 µA	4.5 V to 6.5 V	PDIP, SOIC, bare die	-40° to +85° C	$7.06 PDIP	Now
ISD 1100A Family	EEPROM	512 kbits	n/a	n/a	15	0.5 µA	4.5 V to 6.5 V	PDIP, bare die	n/a	$6.14 PDIP	Now
ISD 2500A Family	EEPROM	4 Mbits	n/a	n/a	25	1 µA	4.5 V to 6.5 V	PDIP, SOIC, TSOP, bare die	-40° to +85° C	$15.88 PDIP	Now
Intel Corp., 5000 W. Chandler Blvd., Chandler, AZ 85226 (800) 344-2280 Circle 478											
2716	EPROM	16kbit	450	55	115	30	5 V/25 V	CERDIP	5962-78022, 883	$30.21	Stock
2732	EPROM	32 kbits	250,450	55	115	35	5 V/21 V	CERDIP	5962-80012, 883	$19.50	Stock
27C256	EPROM	256 kbits	150, 170, 200, 250	25	30	0.2	5 V/21 V	CERDIP, LCC	5962-86063, 883	$26.67	Stock
27C64	EPROM	64 kbits	200, 250, 350	5	30	0.140	5 V/12.75 V	CERDIP, LCC	5962-85102, 883	$11.80	Stock
27C512	EPROM	512 kbits	200, 250	2.5	50	0.1	5 V/12.75 V	CERDIP	5962-87648, 883	$24.05	Stock
27C010	EPROM	1 Mbits	150, 200, 250	2.5	30	0.1	5 V/12.75 V	CERDIP	5962-89614, 883	$129	Stock
27C210	EPROM	1 Mbits	150, 170, 200, 250		50	0.1	5 V/12.75 V	CERDIP, LCC, J-lead, gullwing	5962-86805, 883	$150	Stock
National Semiconductor Corp., P.O. Box 58090, 2900 Semiconductor Dr., Santa Clara, CA 95052-8090 (408) 721-6670 Circle 479											
NM93C46J/883	EEPROM	1 kbit	1,000	10 ms	400	100 µA	5 V/5 V (±10%)	8-pin DIP	Mil-Std-883	$60	Stock
NM93CS66J-SMD	EEPROM	4 kbits	1,000	10 ms	400	100 µA	Same as above	8-pin DIP	5962-915490/MPA, SMD	$73	Stock
SAC-TEC Labs, Inc., 23625 Madison St., Torrance, CA 90505 (310) 375-9647, fax (310) 375-5295 Circle 480											
Custom Devices	EPROM/ EEPROM	—	—	—	—	—	—	Hermetic class S & B	Mil-Std-883	—	
MCM Hybrids	EEPROM/ FLASH	32/16 Mbytes	FLASH	—	—	—	—	S & B	Mil-Std-1172	—	

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3	33	63	93	123	153	183	213	243	273	303	333	363	393	423	453	483	513	543	573
4	34	64	94	124	154	184	214	244	274	304	334	364	394	424	454	484	514	544	574
5	35	65	95	125	155	185	215	245	275	305	335	365	395	425	455	485	515	545	575
6	36	66	96	126	156	186	216	246	276	306	336	366	396	426	456	486	516	546	576
7	37	67	97	127	157	187	217	247	277	307	337	367	397	427	457	487	517	547	577
8	38	68	98	128	158	188	218	248	278	308	338	368	398	428	458	488	518	548	578
9	39	69	99	129	159	189	219	249	279	309	339	369	399	429	459	489	519	549	579
10	40	70	100	130	160	190	220	250	280	310	340	370	400	430	460	490	520	550	580
11	41	71	101	131	161	191	221	251	281	311	341	371	401	431	461	491	521	551	581
12	42	72	102	132	162	192	222	252	282	312	342	372	402	432	462	492	522	552	582
13	43	73	103	133	163	193	223	253	283	313	343	373	403	433	463	493	523	553	583
14	44	74	104	134	164	194	224	254	284	314	344	374	404	434	464	494	524	554	584
15	45	75	105	135	165	195	225	255	285	315	345	375	405	435	465	495	525	555	585
16	46	76	106	136	166	196	226	256	286	316	346	376	406	436	466	496	526	556	586
17	47	77	107	137	167	197	227	257	287	317	347	377	407	437	467	497	527	557	587
18	48	78	108	138	168	198	228	258	288	318	348	378	408	438	468	498	528	558	588
19	49	79	109	139	169	199	229	259	289	319	349	379	409	439	469	499	529	559	589
20	50	80	110	140	170	200	230	260	290	320	350	380	410	440	470	500	530	560	590
21	51	81	111	141	171	201	231	261	291	321	351	381	411	441	471	501	531	561	591
22	52	82	112	142	172	202	232	262	292	322	352	382	412	442	472	502	532	562	592
23	53	83	113	143	173	203	233	263	293	323	353	383	413	443	473	503	533	563	593
24	54	84	114	144	174	204	234	264	294	324	354	384	414	444	474	504	534	564	594
25	55	85	115	145	175	205	235	265	295	325	355	385	415	445	475	505	535	565	595
26	56	86	116	146	176	206	236	266	296	326	356	386	416	446	476	506	536	566	596
27	57	87	117	147	177	207	237	267	297	327	357	387	417	447	477	507	537	567	597
28	58	88	118	148	178	208	238	268	298	328	358	388	418	448	478	508	538	568	598
29	59	89	119	149	179	209	239	269	299	329	359	389	419	449	479	509	539	569	599
30	60	90	120	150	180	210	240	270	300	330	360	390	420	450	480	510	540	570	600

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What is your major design and/or source problem? (Please check all that apply.)

- ❒ Fewer vendors qualified on parts.
- ❒ Fewer vendors interested in military business.
- ❒ Cannot find vendors of commercially-approved parts.
- ❒ Finding new vendors who understand the new requirements.

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EPROMs & EEPROMs

Model #	Technology (EPROM or EEPROM)	Capacity (kbits or Mbits)	Speed-access time (ns)	Speed-write (ns)	Current drain-active (mA)	Current drain-standby (mA)	Voltage (read/write)	Packaging options	Military qualifications	Price (100 pieces)	Availability
Texas Instruments, P.O.Box 60488, MS3028, 120 & FM1788, Midland, TX 79711-0448 (915) 561-6977, fax (915) 561-6716 Circle 481											
SMJ27C256	EPROM	256 kbits	150-300	100 µs (pulse)	25	0.330	5 V	J28-CDIP	Mil-Std-883, 5962-80603	$12.50	Now
SMJ27C512	EPROM	512 kbits	200-300	100 µs (pulse)	50	0.325	5 V	J28-CDIP	Mil-Std-883, 5962-87648	$18.75	Now
SMJ27C040	EPROM	4 Mbits	120-150	100 µs (pulse)	50	0.100	5 V	J32-CDIP	Mil-Std-883, 5962-91752	$243	Now
White Microelectronics, Inc., 4246 E. Wood St., Phoenix, AZ 85040 (602) 437-1520 , fax (602) 437-9120 Circle 482											
WE128K32-XHX	EEPROM	4 Mbits	150	—	250	5	—	PGA/HIP	Mil-Std-883, 5462-94585		Now
WE32K32-XHX	EEPROM	1 Mbit	120	—	200	3	—	PGA/HIP	Mil-Std-883, 5962-94614		Now
WE512K8-XCX	EEPROM	4 Mbits	150	—	80	8	—	DIP	Mil-Std-883, 5962-93091		Now
WE256K8-XCX	EEPROM	2 Mbits	150	—	90	10	—	DIP	Mil-Std-883, 5962-93155		Now
WE128K32-XGX	EEPROM	4 Mbits	150	—	250	5	—	CQFP	Mil-Temp		Now
WF128K32	FLASH	4 Mbits	70-150	—	140 max	6.5	5/5	PGA/HIP & CQFP	Mil-Std-883, certification pending		Now
WF128K32N	FLASH	4 Mbits	120-200	—	120 max	4	5/12	PGA/HIP & CQFP	Mil-Std-883, certification pending		Now
WF512K32	FLASH	16 Mbits	90-150	—	190 max	6.5	5/5	PGA/HIP & CQFP	Mil Temp		Q1'95
WF1024K32	FLASH	32 Mbits	100-150	—	180 max	3	5/12	PGA/HIP & CQFP	Mil-Std-883, certification pending		Now
Xicor, Inc., 1511 Buckeye Dr., Milpitas, CA 95035 (408) 432-8888 Circle 483											
X28C010	EEPROM	1 Mbit	120-250	10 msec.	80	0.5	5/5	LCC, PGA, CER-DIP, Flatpack	883B	—	
X28C512	EEPROM	512 kbits	100-250	10 msec.	80	0.5	5/5	Same as above	883B	—	
X28TC256	EEPROM	256 kbits	35-55	5 msec.	80	0.5	5/5	Same as above	883B	—	
X28VC256	EEPROM	256 kbits	55-70	5 msec.	80	0.5	5/5	Same as above	883B	—	
X28HC256	EEPROM	256 kbits	70-120	5 msec.	80	0.5	5/5	Same as above	883B	—	
X28C256	EEPROM	256 kbits	150-250	10 msec.	80	0.5	5/5	Same as above	—	—	
X28HC64	EEPROM	63 kbits	70-90	5 msec.	80	0.5	5/5	LCC, PGA, CER-DIP	883B	—	
X28C64	EEPROM	64 kbits	150-250	10 msec.	80	0.5	5/5	LCC, PGA, CER-DIP	883B	—	
X2816C	EEPROM	16 kbits	90-250	10 msec.	80	0.5	5/5	Same as above	883B	—	

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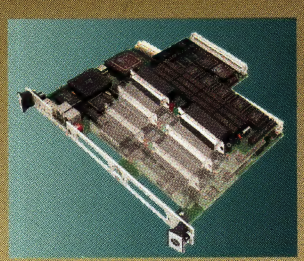

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